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C. W. FORBRICH, Assistant Treasurer.

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Editors:
CHARLES W. PRICE. A. A. GRAY. F. H. BERNHARD.
Associate Editors:
H. FARRINGTON. H. EHRLICH. C. H. SEAVER.

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THE HISTORY OF COMPETITION IN THE TELEGRAPH FIELD.

Ever since the enactment of the law establishing the Public Service Commission in the State of New York, there has been more or less agitation looking to placing telephone and telegraph companies under the supervision of this commission. Quite recently a legislative commission was formed for the purpose of investigating the advisability of this procedure.

At a hearing held on Friday, January 21, Mr. Clarence H. Mackay, president of the Postal Telegraph-Cable Company, made a statement which contains a number of interesting and instructive points. A full abstract of this statement appears on other pages of this issue. Mr. Mackay sketches briefly the conditions in the telegraph business prior to the entrance of the Postal into the field, and points out the tremendous growth which has come to the telegraph business since the early eighties. He reiterates his former statements that the Postal is in no way a part of any combination with either the American Telephone and Telegraph Company or the Western Union Telegraph Company, but admits that there is a reasonable and logical understanding respecting rates.

Commenting on the possibility of further competition from a source outside of the systems already established, Mr. Mackay is of the opinion that a new competing company would be impossible not only because of the great financial investment necessary, but because also of the physical limitations of the natural rights of way. The highways between the principal centers of industry have been preempted by the present systems, and the thoroughfares through which the wire traffic would naturally be carried in the large cities are occupied to their limit. In this respect Mr. Mackay remarks that a telegraph service to be of its greatest ultimate value must have connections with every city and town of reasonable size.

The telegraph business is similar in many respects to the telephone business, but differs essentially in its aspect of usefulness for insular service in small communuities. Fifty residences on a line in a rural community would entail a decent amount of traffic due to the conversational character of telephone communication. In a similar case, however, the telegraph system would be almost useless. However, the telephone system can only reach its point of

greatest usefulness, like the telegraph system, when its service becomes universal in character. This being the case the telephone system, particularly that branch which has to do with long distance work, like the telegraph, hardly comes under the patent of legislation ordained in the State Public Service Act, as but a small portion of its entire business is handled within any one state or territory, and over this interstate traffic the State commission would have no jurisdiction.

THE USE AND ABUSE OF COAL AS A FUEL.

The proper treatment of coal, both before and during combustion, is a question of paramount importance to the operator of each and every steam-driven electric-generating station in the country. The buying of the coal and the kind of coal to be bought will not be discussed in this review, except in so far as it may be mentioned that obviously the main thing is to obtain the kind of coal which, under a given set of conditions (differing widely in various localities), will evaporate the greatest number of pounds of water per dollar expended, and this, it may be remarked, is not necessarily affected by the manner and style of the contract under which the coal is purchased.

The correct methods of storing coal are not as generally understood as should be the case. Coal, after it has been taken from the mine, deteriorates to a considerable extent in heating value. Experiments recently undertaken by the United States Geological Survey at the University of Illinois Experiment Station show that this deterioration is due to the exudation of hydrocarbons (chiefly marsh gas, CH_4), and to the absorption of oxygen. Experience shows also that coal loses materially in heating value every time it is handled and turned over, and while this may be necessary in some cases to prevent spontaneous combustion it is quite certain that efficient storage methods would largely obviate further handling after the coal has once been placed in the bins.

Mr. Richard Threlfall, in a recent paper in the *Journal* of the Society of Chemical Industry, states that there have been no cases of spontaneous fires in coal heaps of less than two metres in height, while on the other hand, when the height exceeds four metres, spontaneous combustion always occurs sooner or later. This would seem to indicate that ten feet is a limit it would be unwise to exceed. The experiences of other authorities confirm this view. Some, indeed, have advocated the storing of coal under water, but it is evident that unless it is necessary to store the coal in deep beds for a very long time, the disadvantages of this method of storage would in most cases more than offset the advantages gained.

In some plants it is the custom to store coal, especially when it is damp or wet, in bunkers above or around the boilers, this presumably with a view to drying the coal so as to render it more efficient in firing. Such a policy is both fallacious and dangerous. The effect of heat on stored coal is to drive off much of the volatile combustible matter and to render it far more liable to oxidization and spontaneous combustion. Coal should be stored in a cool, well-ventilated place. The coal itself may sometimes be ventilated with advantage, and one proposed method of doing this is to insert perforated pipes at intervals in the pile to prevent overheating.

The kind of coal to be used in a furnace (assumed of course to be properly designed) largely affects the efficiency of the plant. Mr. D. T. Randall, in a recent paper read before the American Society for Testing Materials, states that packing in the furnace due to the use of anthracite coal of too small a size results in holes in the fire and a leakage of air in the boiler settings, consequent on the strong drafts needed to burn the fuel under these conditions. He estimates that the loss from this cause alone may amount to as much as ten per cent. This is also true of many of the bituminous coals, especially those which do not coke readily.

In conclusion it may be noted that the employment of efficient firemen and stokers will go a long way toward reducing the coal bill, and a systematic series of records and possibly some kind of a bonus system for good results will aid materially in this connection. These considerations, however, do not obviate the necessity, when changes are to be made, especially in the smaller plants, of seeking the advice of some reputable consulting engineer, who can report on the design and operation of the boilers (grate surface, combustion chamber, methods of firing, storage, handling the coal, etc.) and recommend any saving that may possibly be effected by improvements in these and in the employment of a more efficient (not necessarily more expensive) kind of coal under the obtaining conditions.

A ROUNDABOUT WAY TO CENTRALIZATION.

Under the above caption the *Electrical Times* of London, England, comments editorially on a unique situation which has arisen in Birmingham, England, and which is ascribed to the effects of electrical supply in that city. Due to the excellent systems of electric cars and light and power supply which obtain in and around the great English manufacturing center, the population is rapidly spreading out into the extra-mural suburbs and is rearranging itself into a series of interlinked garden cities, with the result now that the city authorities of Birmingham are seeking to enlarge the boundaries of that municipality. This will undoubtedly take place in the near future, and the *Electrical Times* opines that the immediate effect will be a concentration of electric-supply stations and street-railway systems, with a corresponding scrapping of generating plants and car sheds, and a complete reorganization of the officials connected therewith, all tending to reduction and economy. Our contemporary, in conclusion, says: "In which case, municipalization, which first rendered unification of electrical services impossible, will have been led by the effects of those services to take up unification after all."

HYDROELECTRIC POWER.

What is the available power at a given point on a river, and for what capacity of electric plant will it pay to develop it? These questons frequently come up, and the answers do not appear to be on a uniform basis.

At a particular power site the normal head of water is easily determined, though even this is usually subject to some reduction at times of flood. But with the head of water the exact status of the power privilege ends, because of the variations of river discharge.

On American rivers it is usual to find the ratio of maximum to minimum discharge to be anywhere between fifty and as much as 100 to one, which at constant head means a variation of the total available power within like limits. In spite of these conditions, the man with an undeveloped water privilege to sell confidently asserts that it will develop so many horsepower, and straightway computes the annual earning that may be made by selling the developed output at so much per horsepower.

A little interrogation seldom fails to develop the fact that the asserted horsepower is not the result of the multiplication of the known head by the minimum flow of the stream, but that a much larger rate of discharge has been used for this purpose. When the vendor of the water privilege is asked just how long in each year the assumed flow of water is available, a definite answer is apt to be lacking, and the whole question of the amount of power at that particular site is then open.

It is of course seldom advisable to limit a hydroelectric development to the minimum flow of a stream, which may occur on only a single day during several years, but the important problems is how many times the minimum flows should be represented by the plant capacity. Probably in no instance is it advisable to install a plant to handle the maximum rate of river discharge for this would mean that a part of the equipment could be operated during only a few days per year or in several years.

The practicable development capacity will usually be found to require only a small fraction of the maximum rate of discharge in the river. but still to represent several times its minimum flow, assuming that the market for constant power is greater than can be supplied by this least flow.

As the volume of water proposed to be utilized per second increases above the lowest rate of river discharge, it is found that the number of days per year when this selected flow is available in the stream grows constantly less. The point for commercial development of the water privilege is thus usually determined by the market for non-constant power, or by the relative cost of power developed by the water and by fuel.

If the demand for power requires its development even at high cost by combustion, it may pay to install hydroelectric equipment that cannot be operated more than six months per year. So again, even though the demand for power is not such as to warrant its development at all with fuel, it may be that very cheap power from water can find a profitable market for chemical or other purposes in spite of its inconstancy.

If the demand is for constant power, the total cost including fixed charges of combined water and steam power should be less than the like total cost of steam power alone, to warrant the development of the non-constant water power. Evidently under this rule the greater the cost of power from fuel the shorter will be the annual period during which non-constant water power may be developed at a profit.

Power costs with fuel are such in many localities that it pays to install hydroelectric plant for that portion of river discharge that is available only eight to ten months per year, and in some instances the cost of fuel is so high that the flow of a river which can be counted on during less than one-half of the time may be developed at a profit.

Besides several chemical industries, non-constant hydroelectric power may be applied to the grinding of wood pulp and the crushing of stone.

BOILER ECONOMIES.

Much has been written on the subject of improving the performance of steam boilers, most of the proposed improvements having been in stoking and firing methods. There is one thing, however, in this connection, that does not seem to have had the recognition it deserves, and that is the importance of proper boiler settings and foundations.

A writer in an English technical journal recently deplored the fact that while many firms will willingly pay the price for the best quality of boilers and fittings, they do not seem to think it is necessary to have any expert attention paid to the settings, a general impression being that any ordinary bricklayer is competent to handle this part of the installation.

There is no doubt that if more attention were given to the setting of steam boilers, their efficiencies would be materially improved in most cases. The two most important items here are correct flue area and prevention of leakages to or from the furnaces and the flue.

An example of a recent case in point is that of the Anderson station of the Indiana Union Traction Company, where a great improvement in boiler efficiency was attained by preventing air leakage from the ashpits around the ends of the chain grates into the flues.

Central-station managers would do well to investigate this matter of boiler settings in their plants, and in most cases a few dollars spent in consulting the advices of a boiler expert and in following out his instructions will be amply repaid by the resulting economy in the coal bill.

Attention is also directed to a few remarks on the storage of coal, to be found in the editorial "The Use and Abuse of Coal as a Fuel," on p. 218 of this issue.

Annual Meeting, American Society of Civil Engineers.

The annual meeting of the American Society of Civil Engineers was held in New York city on January 19. Among the matters brought up at the meeting was the report of the special committee to consider the advocacy of the metric system of measurements. This report was presented by Prof. D. A. Molitor, of Cornell University. The committee strongly favored the metric system, calling attention among other things to its simplicity and accuracy. The Baldwin Locomotive Works, of Philadelphia, in a letter to the committee, told of building fifty French locomotives under the metric system without the slightest inconvenience, either to the draftsmen or the workmen. It was suggested by the committee that a copy of the report be sent to each member of Congress and of the New York Legislature calling attention to the limited opportunity which now is offered the present generation to master this important subject and to the benefits to be derived by making its teaching compulsory in the public schools.

The election of the society's officers for the current year was announced as follows: John A. Bensel, of New York, president; John T. Fanning, of Minneapolis, first vice-president; Hunter McDonald, second vice-president; Joseph M. Knap, treasurer, and Charles W. Hunt, secretary.

Twin City Rapid Transit Decision.

With the decision of the Supreme Court upholding the Twin City Rapid Transit Company in the six for a quarter fare case with the city of Minneapolis, the original incorporation of the company for fifty years holds good. The company was organized in 1873, and thus the franchise does not expire until 1923.

In the appeal submitted to the Supreme Court by the city, it was argued that while the company was organized for fifty years, the franchise limit for transportation companies under the Minnesota state laws was thirty years. It was contended that the franchise therefore expired in 1903, making the company subject to any ordinances that the City Council might pass. In answer to this, the company argued that the Twin City did not come strictly and entirely under the head of a transportation company, but should more rightly be classed as a corporation organized for works or internal improvement. Corporations for this purpose were allowed under the state laws to organize for fifty years.

Two other errors were assigned by the city in the appeal. One that the company, by accepting an ordinance of 1890 authorizing a change in motive power from horse to electricity abandoned its rights under the original ordinance of 1875. Also that the city reserved, under the ordinance of 1890, full power to pass any ordinance affecting the fare to be charged that it might think desirable. The city lost on all these points.

Death of E. P. Bryan.

Edward P. Bryan, formerly vice-president of the Interborough Rapid Transit Company, died at San Juan, Porto Rico, on January 24, from apoplexy. Mr. Bryan was spending the winter with his son in Porto Rico. His body was sent to New York for burial. Edward Payson Bryan went to New York from St. Louis, Mo., in 1900 as general manager of the Rapid Transit Subway Construction Company. He was born at Windsor, Ashtabula County, Ohio, in 1847, and received a common school education at Granville, Ohio. At the age of eighteen he began work for the Louisville & Nashville Railroad Company at Brunfield Station, Ky., and rose through the grades of telegraph operator, station agent, and superintendent to the important position of vice-president and general manager of the Terminal Railroad Association of St. Louis, in which city he lived until his removal to New York. In addition to his work for the Interborough company, Mr. Bryan served on the boards of directors of other subway construction companies, the New York & Long Island Railroad Company, and the New York & Queens County Railroad Company.

Toledo & Indiana Electric Sale.

By opposing interests the price of the Toledo & Indiana Electric Railway at receiver's sale on January 18 was run up to $1,058,500, an excess of $138,500 over the appraised value. The property was bid in by C. S. Siehnck, of Toledo, representing the majority bondholders, including the Knickerbocker Trust Company, of New York. D. J. Cable, of Lima, Ohio, presumed to represent the W. Kesley Schoepf syndicate, bid $1,058,000, supposedly with a view to securing a connection between Toledo and the Indiana property of that syndicate.

The previous sale to the minority bondholders at $1,006,000 was set aside on technical grounds. The company operates from Toledo to Bryan, Ohio, a distance of fifty-six miles. Details of intended reorganization are not announced, but are believed to include an extension to Fort Wayne, Ind.

Electric Railways Not Included.

A provision in the Townsend bill that electric railroads in interstate commerce shall not be included under the regulations sought now to be prescribed has attracted some attention.

Representative Townsend said that as far as he knew no representations on the subject were made to the commission which drafted the bill, but it was thought there are so few electric roads doing an interstate business that it was not thought worth while at present to deal with the matter.

The exemption, if enacted into law, will remove any doubts as to whether the Interstate Commerce Commission has authority to supervise the issues of stocks and bonds by such electric roads.

Larger Subway Platforms.

New York city Corporation Counsel Watson has received from the New York Public Service Commission the forms of contract under which the work of lengthening subway platforms and increasing the facilities of the subway twenty-five per cent is to be accomplished. It is expected that he will give his approval to the plan submitted, and if so, the work will be started at once, according to General Manager Hedley of the Interborough Company.

The plan is to lengthen express platforms to accommodate ten-car trains, instead of eight-car trains, the present maximum, and to make local platforms capable of accommodating eight-car trains, instead of five and six-car trains.

German Gyroscopic Car Tested in Brooklyn.

Before a number of prominent engineers and others interested in electric railroading, a demonstration was given on January 10, in the Clermont Rink, Brooklyn, of the gyroscopic monorail car of the German type, invented by Richard Scherl. An oval single track, with a spur running into one of the anterooms, was laid around the rink, and on this the car ran easily in perfect balance.

Thomas Alva Edison.

A representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN called on Thomas A. Edison at his laboratory in Orange, N. J., recently. He found the distinguished inventor as full of energy and cheerfulness as at any period of his acquaintance, which extends over a quarter of a century.

"How about flying machines?" was the first question.

"I keep down. The apex of the Himalayas is high enough for my work."

"I hear your storage battery is completed to your satisfaction," was the next remark.

"Yes," he replied, "I am satisfied after several years of interesting, though at times exasperating, experiment. It has been a wonderful study"—and the inventor's eyes sparkled, as he recalled the various stages of the work which had finally ended triumphantly.

"What about cement houses for the working man?" was asked.

"That is a field capable of great expansion," replied Mr. Edison. "With 200 barrels of cement and the dirt dug out to make the cellar, I can make a house at a cost of not more than $1,200. I want you to see the model."

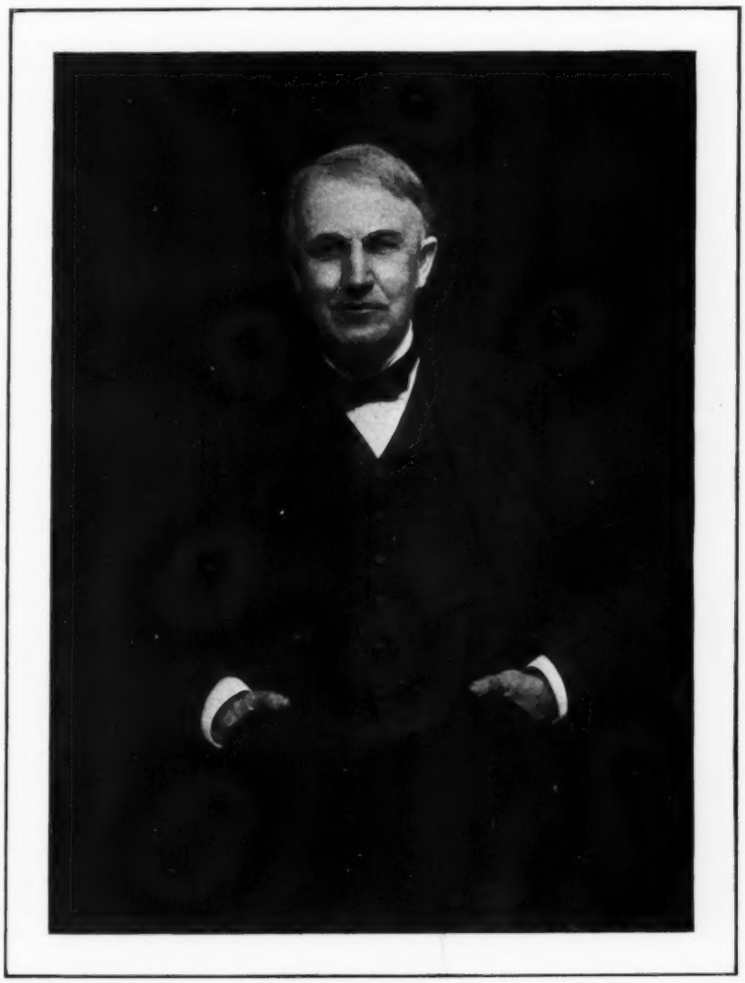
Leading the way with springy step, Mr. Edison and the newspaper man left the workshop and went to the library, where a two-story model cement house was exhibited on a table. It apparently included every desirable convenience—parlor, dining room, kitchen, bath-room, sleeping rooms, porch and an abundance of windows—that could be desired by a working man or person of small means. Edison thinks it solves the problem of homes for the thrifty working man, and he takes special pleasure in speaking of what he has accomplished in this direction.

"Are you doing anything electrical?" was asked.

"Yes," he said, "I have several things coming along, but must not talk about them yet."

"Do you take your annual rest in Florida?" was asked.

"Yes," Edison replied, "I leave February 1; but it is not exactly rest. I have a great deal of pleasure and fun, however, at the same time that I carry on a number of experiments. As you know, I have a laboratory there, and take five men with me, and shall stay for two months. It is a great scheme. I have been doing it for many years; in fact, had this place for over twenty-six years. Any person who can get away from his business for thirty-six hours and can carry it on by mail can live in Florida for a month or two in the winter very easily. Come down and try it."



THOMAS ALVA EDISON.

The Great Electrical Inventor, Whose Storage Battery Has Just Received a Successful Test in Street Car Service.

A Significant Gift to the University of Illinois.

The Commonwealth Edison Company, of Chicago, and the General Electric Company, of Schenectady, have jointly presented to the Department of Electrical Engineering of the University of Illinois, a 125-kilowatt steam turbo-generator. The turbine of this unit is to be non-condensing. The generator is to be designed for three-phase, sixty-cycle currents, to be delivered at 2,300 volts. With the addition of this machine the electrical laboratory will be prepared to deal extensively with problems involving single-phase, two-phase and three-phase currents.

The significance of this announcement is increased by the fact that this turbo-generator, which is secured for the University through the interest of the Commonwealth Edison Company, constitutes the first large gift which thus far has ever been received by the College of Engineering. This gift, following closely, as it does, after the coming to the University of Dr. E. J. Berg as Professor of Electrical Engineering, may be accepted as marking a new era in the activities of the Department of Electrical Engineering at the University.

An Indiana Power House Site Decision.

In an action brought to condemn land for a power house and car barns by the Portland & Muncie Traction Company the Supreme Court held that the value of property taken for such purposes must be determined by all the uses to which men of ordinary prudence and wisdom would devote the property if owned by them, rather than by a fancy price because of circumstances requiring the site. This decision is of importance to traction interests in Indiana. S.

Chicago Electrical Show.

A Successful Exposition at the Coliseum, January 15-29, 1910.

In point of attendance the Fifth Annual Electrical Show, held at the Coliseum, under the auspices of the Chicago Electrical Trades Exposition Company, from January 15 to January 29, has been a worthy successor to the notable exhibitions which have preceded it.

Manager Homer E. Niesz has stated that the paid attendance for the first six nights of the show was a little in excess of that for the same period of the best previous year, and that the attendance on Saturday, January 22, broke all previous records.

The exhibitions this year indicate the trend of the manufacturers of smaller appliances to take a greater interest in the exhibition, with an apparent inclination to eliminate to a considerable degree the demonstration of heavier apparatus, such as prime movers and electrical machinery of great capacity.

Industrial power and domestic appliances, together with examples of arc and incandescent lighting, and glassware and art glass auxiliaries predominated. There was also an excellent demonstration of telephone apparatus for every nature of service, and a pretty complete representation of electric vehicles with their kindred charging appliances, and storage batteries of both stationary and portable types.

The feature which contributed greatly to the attraction of the more curious of the public, was the Government aeroplane with which some practical tests in wireless telegraphy were carried out. There was also a series of afternoon and evening lectures in the annex in the south end of the Coliseum, arranged by the Commonwealth Edison Company, where a considerable amount of entertainment was given without any extra cost to those in attendance.

The model garage exhibited by the Commonwealth Edison Company attracted a great deal of attention, the latter company being responsible also for a very interesting and comprehensive industrial power exhibit, and a handsome display of domestic heating, cooking and lighting devices from its "Electric Shop."

The Chicago Telephone Company, in conjunction with the American Telephone and Telegraph Company, exhibited a standard central exchange, and demonstrated its long distance service. This exhibit was constantly surrounded by large numbers of interested spectators, and the attendants in charge were kept busy explaining the functions of the switchboard and operators. The company also distributed an instructive pamphlet giving a great deal of useful information concerning the proper use of the telephone.

Among the exhibitors of fairly large sized apparatus, including turbines, gasoline engines of moderate capacity, dynamos, motors and motor-generators, were the Allis-Chalmers Company, Fairbanks, Morse & Company, Fort Wayne Electric Works, General Electric Company, Kimble Electric Company, National Acme Manufacturing Company and Westinghouse Electric and Manufacturing Company.

Electric signs were well represented by the American Sign Company, Federal Electric Company, Neville Illuminating Sign Company and Oral and Motion Manufacturing Company.

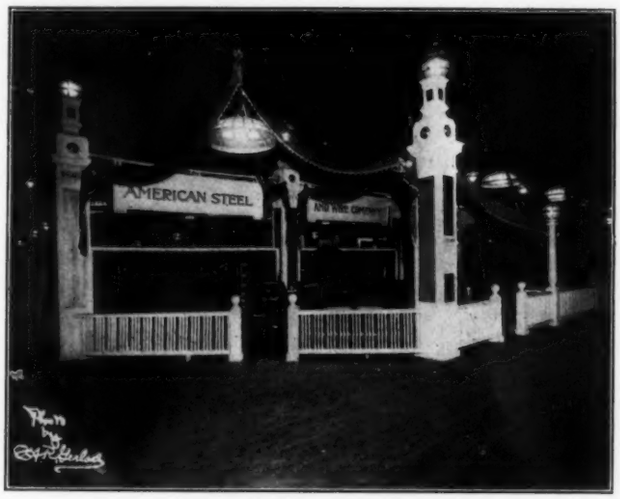
The displays by the wire manufacturers were representative and included the American Steel and Wire Company, the Acme Wire Company, the Driver-Harris Wire Company, and the Stromberg-Carlson Telephone Manufacturing Company.

Electrical heating and cooking apparatus formed a goodly portion of the exhibition, the representative companies being the Consolidated Electric Appliances Company, the Del Sales Company, the American Ironing Machine Company, the Hoskins Manufacturing Company, G. L. Jackman, Pelouze Electric Heater Company, Pacific Electric Heating Company, Simplex Electric Heating Company, and Vulcan Electric Heating Company. The General Electric Company and the

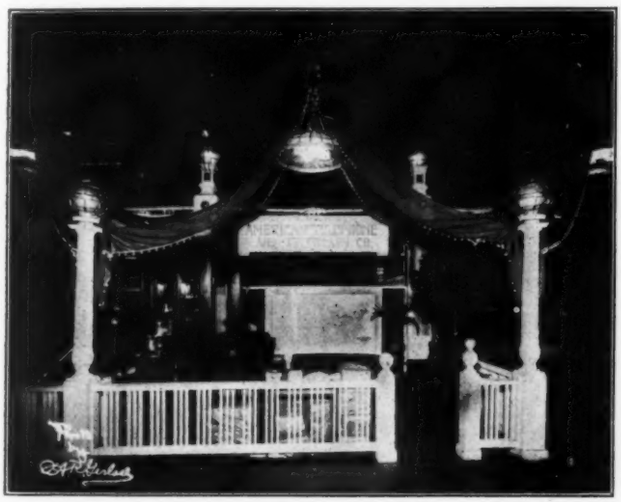
ACME WIRE COMPANY.

ALLIS-CHALMERS COMPANY.

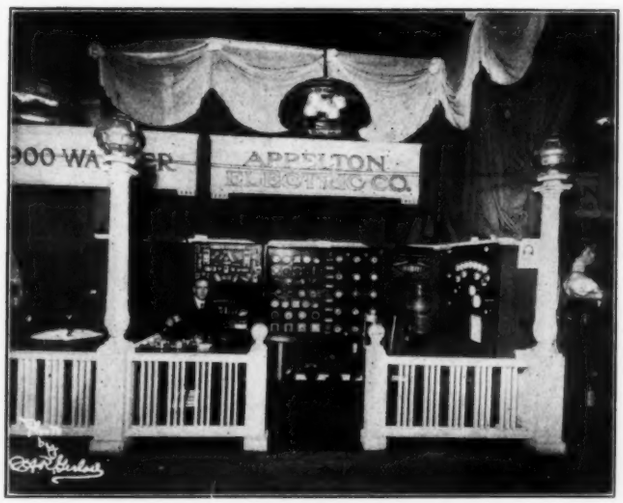
AMERICAN SCHOOL OF CORRESPONDENCE.



AMERICAN STEEL AND WIRE COMPANY.



AMERICAN TELEPHONE AND TELEGRAPH COMPANY.



APPLETON ELECTRIC COMPANY.

CHICAGO FUSE WIRE AND MANUFACTURING COMPANY.

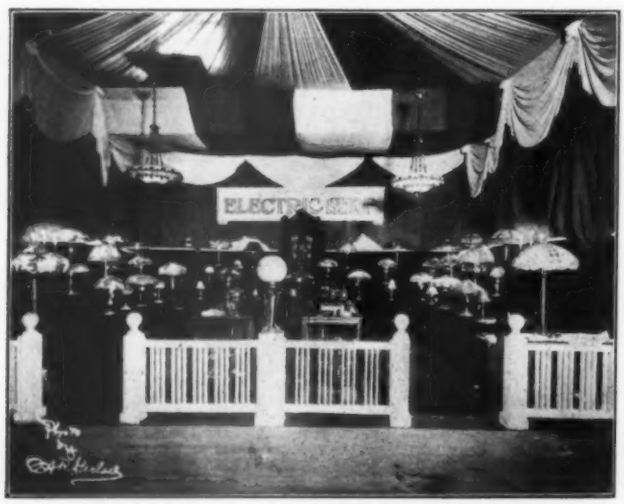
CHICAGO TELEPHONE COMPANY.

CUTLER-HAMMER MANUFACTURING COMPANY.

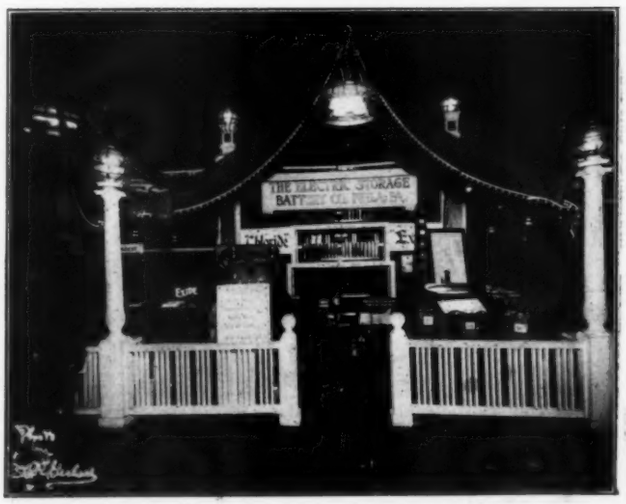
DRIVER-HARRIS WIRE COMPANY.

ELECTRICAL TESTING LABORATORIES.

ELECTRIC CLEANER COMPANY.



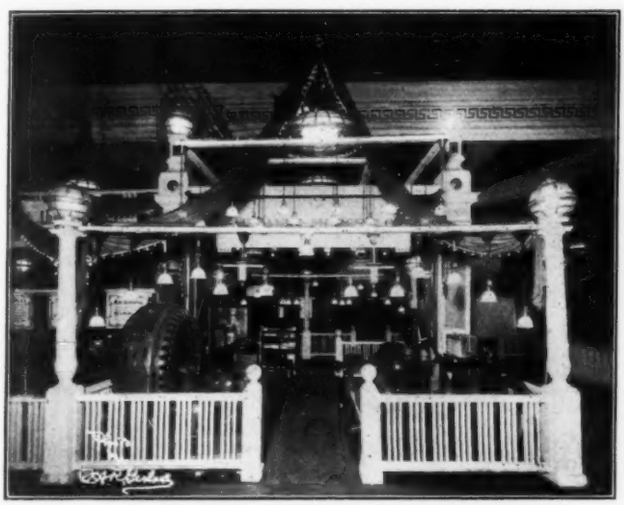
ELECTRIC SHOP, COMMONWEALTH EDISON COMPANY.



ELECTRIC STORAGE BATTERY COMPANY.

ELECTRO-MAGNETIC TOOL COMPANY.

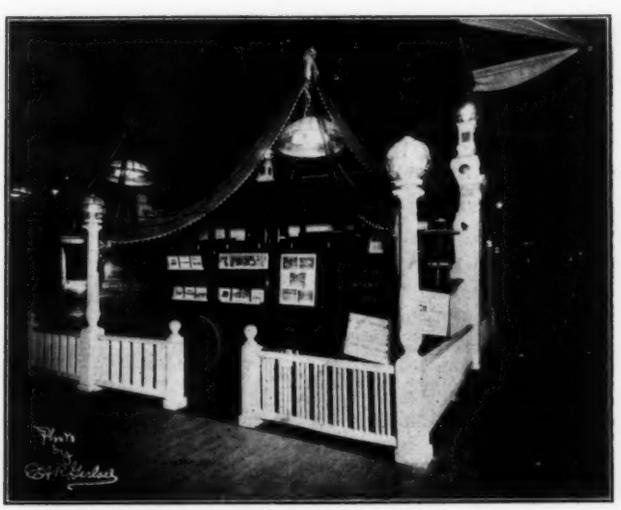
EXCELLO ARC LAMP COMPANY.



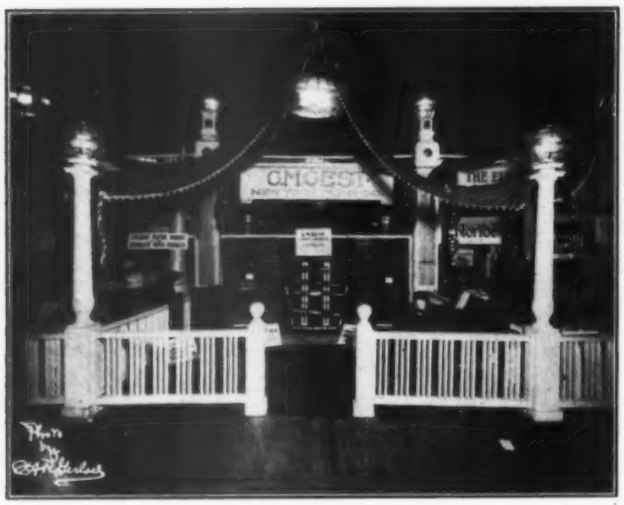
FAIRBANKS, MORSE & COMPANY.

FORT WAYNE ELECTRIC WORKS.

GENERAL ELECTRIC COMPANY.



GENERAL VEHICLE COMPANY.



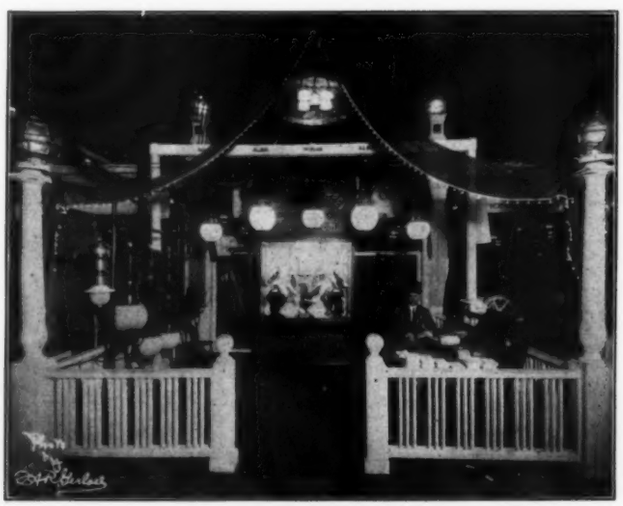
G. M. GEST.

HURLEY MACHINE COMPANY.

ILLINOIS APPLIANCE COMPANY.

JUDD LAUNDRY MACHINE COMPANY.

KELLER MANUFACTURING COMPANY.



CHAS. L. KIEWERT COMPANY.

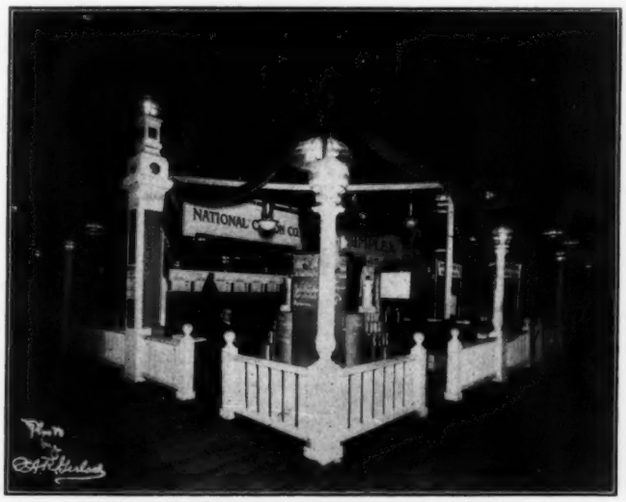
KIMBLE ELECTRIC COMPANY.

MATHIAS KLEIN & SONS.

A. W. KRATZ.

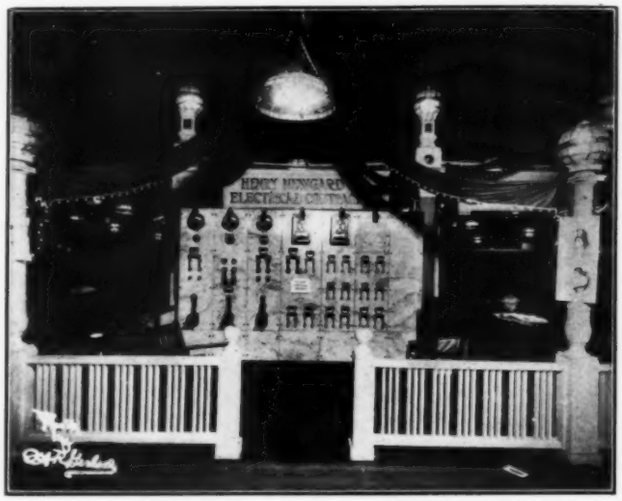
LONG BEACH ELECTRIC MANUFACTURING COMPANY.

MANHATTAN ELECTRICAL SUPPLY COMPANY.



NATIONAL CARBON COMPANY.

NATIONAL ELECTRIC LAMP ASSOCIATION.



HENRY NEWGARD & COMPANY.

PACIFIC ELECTRIC HEATING COMPANY.

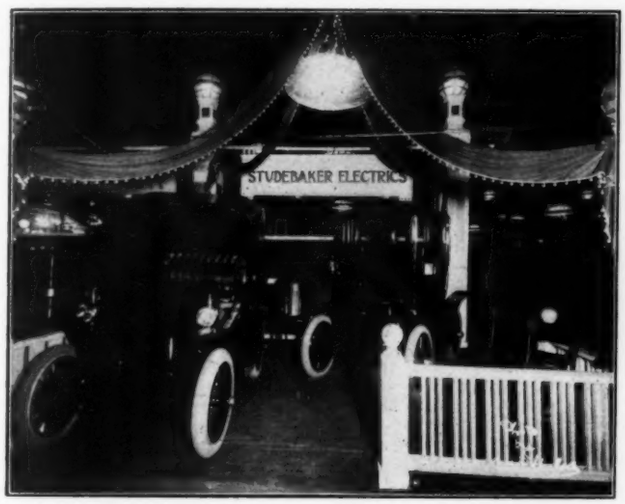
PELOUZE ELECTRIC HEATER COMPANY.

PORTABLE GARAGE, COMMONWEALTH EDISON COMPANY.

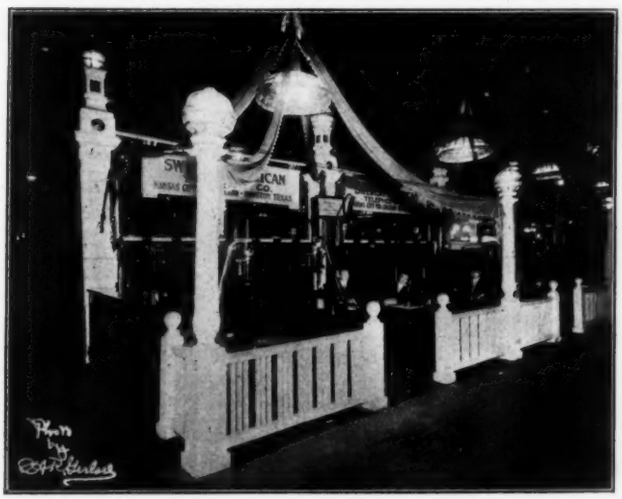
SEFTON MANUFACTURING COMPANY.

SIMPLEX ELECTRIC HEATING COMPANY.

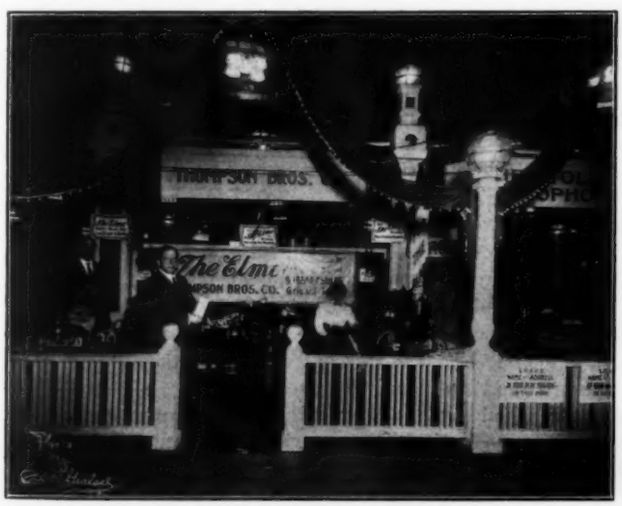
STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY.



STUDEBAKER BROTHERS MANUFACTURING COMPANY.



SWEDISH-AMERICAN TELEPHONE COMPANY.



THOMPSON BROTHERS COMPANY.

UNITED STATES LIGHT AND HEATING COMPANY.

Westinghouse Electric and Manufacturing Company also exhibited a comprehensive line of electrical heating and cooking devices.

The engineering department of the National Electric Lamp Association made a splendid display of every type of incandescent lamp, and gave the public a popular demonstration of the illuminating qualities of Mazda lamps. This demonstration also afforded an excellent opportunity for the demonstration of various forms of Holophane reflectors and demonstrated the color values of various types of incandescent lamps. The General Electric Company and the Westinghouse Electric and Manufacturing Company also exhibited both incandescent and arc lamps, and Fairbanks, Morse & Company exhibited a complete line of incandescent lamps and reflectors. The Macbeth-Evans Glass Company made an elaborate display of lamps and artistic glassware.

A striking display of flaming arc lamps was made by the Excello Arc Lamp Company and the Charles L. Kiewert Company.

Telephone apparatus was well displayed by the Collins Wireless Telephone Company, Manhattan Electrical Supply Company, Stromberg-Carlson Telephone Company, Swedish American Telephone Company, and the Western Electric Company.

Electric washing and vacuum cleaning machines were very extensively exhibited. The representative exhibitors were the Duntley Manufacturing Company, E-Z Vacuum Cleaner Company, Electric Cleaner Company, Empire Vacuum Company, Hoover Suction Sweeper Company, Houston Manufacturing Company, Hurley Machine Company, Judd Laundry Machine Company, Keller Manufacturing Company, A. W. Kratz, Milwaukee Vacuum Machinery Company, Nohe Electric Renovator Company, Perfection Vacuum Cleaner Company, and Thompson Brothers Company.

Fittings and supplies, including switch boxes, fuses, outlet boxes and conduits were exhibited by the Appleton Electric Company, Chicago Fuse Wire and Manufacturing Company, Long Beach Electric Manufacturing Company, Manhattan Electrical Supply Company, Henry Newgard Company, Stromberg Electric Manufacturing Company, Schneible Company, and the Telechronometer Company.

Stationary and portable batteries were exhibited by the Electric Storage Battery Company, and the United States Light and Heating Company.

Conduits and conduit construction were demonstrated by G. M. Gest and the Grand Ledge Clay Product Company.

Electric vehicles were represented by the General Vehicle Company, Walden W. Shaw Company, Studebaker Brothers Manufacturing Company, and Ralph Temple Automobile Company.

Educational facilities were exhibited by the American School of Correspondence.

Electrically driven pumps and reducing apparatus were exhibited by the Bishop & Babcock Company.

Other exhibitors were the Automatic Printing Press Company, card printing presses; Como Electric Company, electrolytic rectifiers; Crane Company, piping material; Chicago Pneumatic Tool Company, portable tools; Cutler-Hammer Manufacturing Company, electric controlling devices; Electro-Magnetic Tool Company, electric hammers and drills; Electrical Testing Laboratories, electrical testing devices and demonstrations of lamp color values; Enterprise Optical Manufacturing Company, projecting instruments and supplies; C. G. Everson & Co., electroliers, fixtures, etc.; General Acoustic Company, acoustiecon and dictograph; Hahl Automatic Clock Company, program clocks; Hamler-Eddy Smoke Recorder Company, automatic smoke recorder; Hinde & Dauch Paper Company, corrugated paper products; Illinois Appliance Company, adaptable lamp changer; Mathias Klein & Sons, tools; North Shore Electric Company, domestic and power exhibit; National Carbon Company, batteries and carbon products; N. L. Schlueter, floor surfacer; Shelton Electric Company, vibrators; Stolz Electrophone Company, electrical acoustic apparatus; Sefton Manufacturing Company, corrugated paper and packing boxes; Tel-Electric Company, electric pianos.

WESTERN ELECTRIC COMPANY.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

The technical and trade press were represented by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, *Electrical World, Electrical Record, Electrocraft, Electrical Age, Popular Electricity,* and *Telephony.*

Among those long familiar with the industry who were seen during the show were the following: A. D. Page, F. H. Gale, F. W. Wilcox, F. T. Benson,

General Electric Company; H. B. Vanzwoll, Sunbeam Incandescent Lamp Company; E. H. Haughton, Sam Furst, Bryan-Marsh Company; James Wolff, New York Insulated Wire Company; H. H. Cudmore, Brilliant Electric Company; Frank G. Bolles, Allis-Chalmers Company; M. Lobenthal, Economical Electric Lamp Company; W. S. Howell, Electrical Testing Laboratories; V. R. Lansingh, C. R. Howe and H. D. Howe, Holophane Company; P. S. Klees, Franklin Electric Manufacturing Company; H. M. Hirschberg and G. W. Armstrong, Excello Arc Lamp Company; W. R. Bonham, Sterling Electrical Manufacturing Company; H. C. Rice, General Incandescent Lamp Company; J. W. Phelps, Phelps Manufacturing Company; W. T. Jackson and J. A. Doyle, G. M. Gest; Joseph H. Cooke, Buckeye Electric Company; C. P. Cook, Campbell Electric Company; A. N. Fox, George C. Knott, Benjamin Electric Manufacturing Company; F. B. Badt, F. B. Badt & Company; G. A. McKinlock, Charles E. Brown, H. W. Young, Central Electric Company; A. S. Merrill and W. W. Merrill, Chicago Fuse Wire and Manufacturing Company; C. B. Coates, Chicago Pneumatic Tool Company; J. H. McGill and F. R. Bryant, Crescent Company; R. M. Van Vleet, Cutler-Hammer Manufacturing Company; P. R. Boole, Electric Appliance Company; A. J. Francis, Fort Wayne Electric Works; Godfrey H. Atkin, Electric Storage Battery Company; H. M. Frantz, H. W. Johns-Manville Company; C. C. Baird, McRoy Clay Works; H. F. Holland, Pacific Electric Heating Company; H. C. Slemin, Stromberg-Carlson Telephone Manufacturing Company; E. B. Overshiner and A. V. Overshiner, Swedish-American Telephone Company; T. P. Gaylord, W. R. Pinckard, A. L. Millard, W. Barnes, Jr., Westinghouse Electric and Manufacturing Company; George Cutter, George Cutter Company; E. H. Heilstedt, Chicago Mica Company; Albert Scheible, Ajax Line Material Company; J. R. Wiley, Standard Underground Cable Company; E. J. Kulas, Tungstolier Company; J. S. Corby, Monarch Incandescent Lamp Company; F. B. Rae, Jr.; W. R. Gorton, New York & Ohio Company; F. T. Murphy, National Brake and Electric Company; Gerald Hart, Hart Manufacturing Company; Paul F. Bauder, National Electric Lamp Association; P. C. Ackerman, Acme Wire Company; Arlington Bensel, Driver-Harris Wire Company; K. A. Albrecht, Charles L. Kiewert Company; E. Kirkpatrick, Kirkpatrick Conduit Company.

Rejuvenation of the Sons of Jove.

A rejuvenation of the Sons of Jove was held in connection with the Fifth Annual Electrical Show at the Coliseum, on Friday evening, January 21. A class of forty-five candidates was initiated. Fred P. Vose, statesman at large, acted at Jupiter, assisted by Perry Boole, Pluto, H. W. Young, Neptune, H. B. Otis, Mars, and H. F. Holland, Vulcan. R. M. VanVleet, Mercury, and Edward Strickland, national representative, also assisted in the induction and initiation of the candidates.

Following the initiation, some 200 Sons of Jove sat down to a delightful Dutch supper, a number of those present being called upon for rapid-fire speeches by toastmaster Frank L. Perry. Among those responding to the toasts were Lieutenant B. D. Foulois, the guest of honor, George Cutter, Perry Boole, William S. Taussig, C. A. Howe, J. M. Schilling, H. T. Matthew and A. A. Gray.

Annual Meeting of the American Society of Heating and Ventilating Engineers.

The sixteenth annual meeting of the American Society of Heating and Ventilating Engineers which was held in the Engineering Societies building, New York city, on January 18, 19 and 20, was called a review meeting, and the reports of a large number of committees were read and discussed. The society has a membership of some 400 and over 200 members and guests were in attendance, the heating rather than the ventilating interests predominating.

The review committee on electric heating presented a short report, which, like the other review reports, gave a summary of the literature that had been found on the subject of electric heating on a large scale, such as house heating. For this service electricity cannot be an active competitor with steam until its unit cost is very greatly reduced.

The reports of a similar committee on central heating plants was not presented in its final form and the committee called attention to the lack of data on the subject.

The officers elected for the ensuing year are as follows: James D. Hoffman, Lafayette, Ind., president; Reginald P. Bolton, New York city, first vice-president; Samuel R. Lewis, Chicago, Ill., second vice-president; Wm. M. Mackay, New York city, secretary; U. G. Scollay, Brooklyn, N. Y., treasurer; R. C. Carpenter, Ithaca, N. Y., Judson A. Goodrich, New York city, James Mackay, Chicago, Ill., Geo. W. Barr, Philadelphia, Pa., and John F. Hale, Chicago, Ill., board of governors.

States Cannot Tax Corporate Property Outside Their Bounds.

In a decision by the United States Supreme Court rendered a short time ago by Justice Harlan, the State of Kansas loses its suit against the Western Union Telegraph Company. The question involved was whether the state had the right to make a law taxing the capital of a company elsewhere. The amount involved was $20,100.

Justice Harlan declared that if the Kansas law was good law, then business of the country would be thrown into confusion and chaos. The proceedings were therefore declared void.

The decision is recognized as of far-reaching importance, as circumscribing powers of a state to tax foreign corporations doing an interstate commerce business.

The court laid special stress upon the fact that the license fee of Kansas equaled eight per cent on the capital stock of the company not only in Kansas, but everywhere else, and was confiscatory. It was not only that, but it took a stated annual sum from the company regardless of the business done.

Private Rights of Way Favored.

At a hearing on the petition of the Meriden, Middletown and Guilford Electric Railway Company for authority to acquire certain lands in Connecticut by condemnation proceedings the Railroad Commissioners made an interesting announcement concerning their policy.

They stated that it was their desire to encourage trolley lines to operate on private rights of way rather than on the public highways. They explained that if the line ran over private ground better time could be made and at the same time the dangers of the public highways would be reduced. They believe that, especially in the case of suburban and interurban lines, it is desirable for electric roads to run over private grounds as much of the distance as is feasible.

First Test of the Edison Storage Battery Car.

On January 20 tests were made at West Orange, N. J., of Thomas A. Edison's new storage battery car on the tracks of the Public Service Company. Among the interested observers were a number of men from the Public Service trolley systems, and they agreed with the inventor that he has made great strides towards the perfection of a street car that can be run cheaply and practically without the use of current wires.

Press dispatches say that when the first tests were made Mr. Edison was not present, so confident was he that he would get a favorable report from the men who ran the car. He told them to go ahead and he would not leave his work in the laboratory. Later, however, he visited the scene of the experiments and took a ride in the car.

As he rode over the stretch of track Mr. Edison was looking out of the car window. He saw two youngsters pointing to the car going along without a trolley pole. He smiled and turning to the man who sat at his side said:

"When you were a kid like those your eyes were just as big when you saw your first car going along the street without horses. Those youngsters will live to see the day when there will be no cars but this kind on the tracks of street railways."

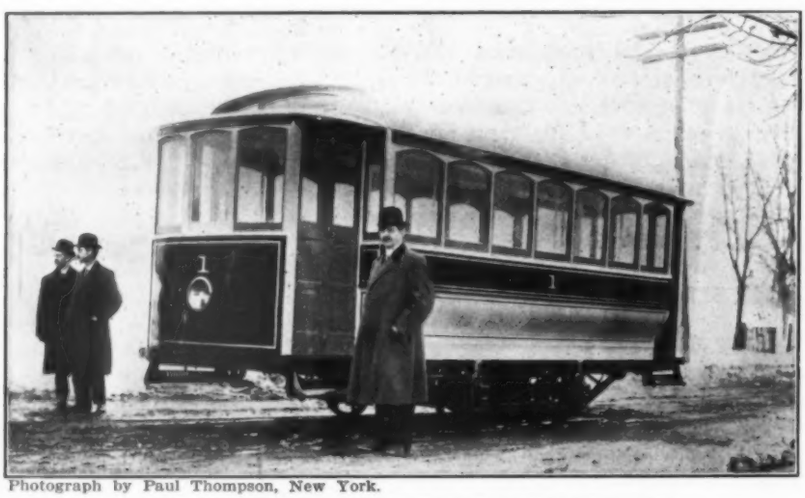
In the experimental trip the car attained a maximum speed of twenty miles an hour and responded in every way to the tests put upon it.

The experimental car is twenty-six feet long and seven feet six inches wide. It is equipped with two seven and one-half horsepower motors, and charged to the full capacity of the batteries it will run 150 miles without a renewal of the charge. The car weighs about five tons. The car was housed in the barns of the Public Service Company after the tests and further trials will be made from time to time.

Mr. Edison meant to make a test run to Philadelphia within a short time, but was disappointed to learn from a Public Service man that it will be impossible, as the gauge of the tracks south of Trenton is wider than the standard in the northern part of the state.

The wizard is working now on a car heater which he says will surpass in radiating power and cheapness any that have yet been produced.

The cost of operating the new car is estimated to be one cent a mile.



Photograph by Paul Thompson, New York.

TEST CAR EQUIPPED WITH EDISON STORAGE BATTERIES.

Electrical Show at Illinois University.

It is with interest that one turns from the discussion on industrial education in the Proceedings of the American Institute of Electrical Engineers to the University of Illinois. That school has, this year, 311 students in Electrical Engineering, fifty-seven of whom are in the senior class. The students of the electrical engineering department at Illinois will give an Electrical Show on the 10th, 11th and 12th of February. It must be with gratification that the advocates of industrial co-operation read of this show. This is the third show given by the Electrical Engineering Society at Illinois. These enterprises have attracted national attention and it is with much interest that the outcome of the third show is awaited. Interesting student's exhibits were shown at the Chicago Show.

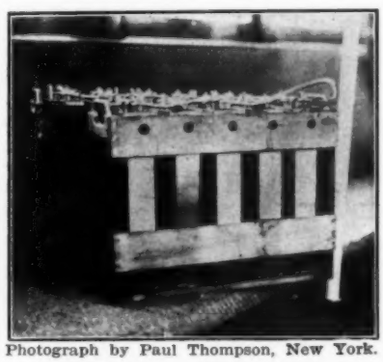
Morgan & Company to Finance Railway.

Theodore P. Shonts, president of the Interborough-Metropolitan Company, announced at the annual meeting of the stockholders of the company held recently, that J. P. Morgan & Company were ready to furnish $100,000,000, or more, to finance new lines that may be constructed by the company. He did not, however, name the conditions which Morgan & Company had made.

Pittsburg Section, American Institute of Electrical Engineers.

The Pittsburg Section of the American Institute of Electrical Engineers held its regular meeting on January 11, 1910, in the Carnegie Lecture Room.

Harold W. Brown, for several years in charge of the meter department of the Westinghouse Electric and Manufacturing Company, presented an original paper on "Recent Design in Electrical Measuring Instruments." Mr. Brown showed lantern slides illustrating the most recent designs of both European and American indicating, integrating and recording meters, including also instruments using electricity for measuring other quantities.



Photograph by Paul Thompson, New York.

THE EDISON BATTERY USED.

The practical advantages to the operator effected by the revised designs were clearly pointed out and the discussion which followed was one of the best of this season.

Edison Manufacturing Plant Burns.

The plant of the Edison Manufacturing Company at Belleville, N. J., was practically destroyed by fire on January 19. The plant consisted of a number of frame buildings and gave employment to about 200 men. It provided the other factories of the company with storage batteries. It was said that the direct loss would in all probability not exceed $50,000.

The History of Competition in the Telegraph Field.

On Friday, January 21, testifying before the New York State legislative committee which has been appointed to look into the advisability of placing telephone and telegraph companes under the jurisdiction of the Public Service Commission, Clarence H. Mackay, president of the Postal Telegraph-Cable Company, disclosed some interesting history respecting telegraph competition in this country. Mr. Mackay has been president of the company since the death of his father, in 1902. In reply to the questions put to him he asked permission to read his statement, explaining that it went into features of the company's career which he would like to bring before the committee. An abstract of the statement follows:

"Early in the year 1881, the Western Union Telegraph Company, under the leadership of Jay Gould, acquired control of all the commercial telegraph lines in the United States. The smaller companies that had previously been built up had proved unprofitable and impossible of permanent maintenance, every one of them having been founded upon mistaken notions of living on local business and of various so-called improvements in methods of transmission, reduced rates, rebates, and other forms of bidding for business, which soon proved to be ruinous; or upon a speculative plan not designed to be permanent, but to do the most harm in the shortest time for the purpose of being 'bought off.' The most available routes for the construction of telegraph lines between principal points had been occupied.

"Under such circumstances, it was a common belief on the part of the public, and also of many of the best informed telegraph managers and employes, that competition in the business was at an end; that no capital would be found to undertake the building of new lines, and that no telegraph officers having the necessary experience and ability to conduct the business successfully would hazard their reputation by entering upon so hopeless an enterprise.

"The 'Mutual Union,' the 'American Rapid,' the 'Bankers and Merchants',' the 'Baltimore & Ohio,' the 'Southern,' the 'Board of Trade,' the 'Pacific Mutual,' and the original 'Postal,' were among the most extensive and important of the corporations that were formed, and all were competing with each other as well as with the Western Union Company in the most wasteful manner.

"In this almost chaotic condition of affairs of the telegraph, my father, John W. Mackay, came into the control of the property bearing the 'Postal' name. Having his own ideas of the usefulness of the telegraph, he set about to establish a competitive telegraph and cable system on a permanent basis, and he did so.

"The Postal Company began a stormy existence by being met with a war of telegraph rates. Prior to its entry into the telegraph field, the rates were very high, which in addition to the service rendered by the monopolistic company was the subject of universal complaint.

RIVALRY LOWERED RATES.

"The following table setting forth the rates before and after the telegraph war, whereby millions of dollars annually were saved to the people of the United States from the reductions, speaks for itself:

	Old rate.	Present rate.
New York and Arkansas.....	$1.00	$0.60
New York and California.....	1.50	1.00
New York and Colorado.....	1.25	.75
New York and Idaho.....	1.50	1.00
New York and Kansas.....	1.00	.60
New York and Louisiana.....	1.00	.60
New York and Minnesota.....	1.00	.60
New York and Montana.....	1.50	.75
New York and Nebraska.....	1.00	.60
New York and North Carolina	.75	.50

"In short, a detailed comparison of the present rates with those in force in the early eighties would probably show reductions from twenty to fifty per cent, which can only be attributed to the competition of the Postal Telegraph Company.

"The company went ahead and constructed various lines and made various connecting-line contracts and purchased the property and franchises of the Michigan Postal Telegraph Company and a line between Pittsburg, Cincinnati and Indianapolis, and acquired, through purchase of stock, the lines of the Pacific Mutual Telegraph Company, the Board of Trade Telegraph Company, the Pacific Telegraph Company and various other companies, besides building a great many lines itself in different parts of the country.

"It has been absolutely necessary to maintain the corporations of which ownership was acquired as separate corporate entities and to form new corporations in states where the property was not already owned by a local corporation, and to have each company own and operate the property in the state in which it is organized. This policy has been necessary for a number of reasons, among them being that new telegraph companies were obliged to build their lines on highways (the Western Union having practically monopolized the rights of way along railroads under exclusive contracts with railroads) and were frequently compelled to condemn rights of way. In a great many states city ordinances are granted only to domestic corporations, and only domestic corporations may condemn rights of way.

"Having been forced to establish local companies, we feel that it is our legal duty to operate them, not as mere dummies, but as going, solvent, bona fide corporations, owning and operating their own property and keeping their own separate accounts. Therefore these various companies have entered into contract relations with each other, under which each company receives its proper proportion of the tolls on the interstate business handled by it, which proportion is based upon and is commensurate with the work performed by it in connection with such handling.

PROPOSES TO STAY INDEPENDENT.

"As to maintenance of competition, I wish to state that the Postal Company has been free and independent from the time of its organization in 1886, and proposes to remain so. It has not the slightest influence or control over the American Telephone and Telegraph Company or the Western Union Telegraph Company. It took no part in the recent purchase of the Western Union Telegraph Company by the American Telephone and Telegraph Company, and was not consulted and knew nothing about it until after it had been accomplished. The Postal Company will now have to compete with both of them instead of competing with the Western Union alone, as heretofore.

"The recent statements in the press that the change of name of the Postal Telegraph-Cable Company to Transcontinental Telegraph Company is a part of the combination is incorrect. Confusion has resulted from the fact that we have a company known as the New England Telegraph Company, while the Bell Telephone interests have a company known as the New England Telephone and Telegraph Company, with which company we have nothing to do. We are proceeding now to change the name of our company, the New England Telegraph Company, so that the business may continue to be done in the Postal name.

ONLY RESTRAINT ON MONOPOLY.

"The Postal is the only company that has ever succeeded in competing with the old land line telegraph monopoly, and it has done so for twenty-five years. If the Postal Company were united with the telephone and Western Union there would never be another competing telegraph company, because no telegraph company can succeed unless it reaches every state and every important city and town, and not only would that require a vast sum of money, but it would be physically impossible, inasmuch as in many of the great cities there is no room left in and under the important streets, and entrance could not be obtained. Between many of the important commercial centers as, for instance, between New York and Philadelphia, it is impossible now to find another right of way on the highways for a through line. The Postal Telegraph Company will be the last competitor in telegraphy, and when that competition ceases there will be a choice only between monopoly and government ownership.

"We have no objection," said Mr. Mackay in conclusion, "to being placed under the Public Service Commission if that is desired by the state. I would, however, call attention to the fact that the telegraph business is very different from the telephone business, in that our records show that about seven-eighths of the telegraph business in New York state is interstate, over which, I suppose, the Public Service Commission would have no jurisdiction. Nevertheless, if the state desires it, we have no objection."

AN UNDERSTANDING ON RATES.

When Mr. Mackay had finished with the statement, Senator Davis asked him if he did not think that a reduction of rates charged for messages would result in more business for the company.

"The rates are very fair now," replied Mr. Mackay. "There is an understanding in a general way as to rates, just as there is between railroad companies. The competition is as to the handling of the business."

Mr. Mackay remarked that, while English companies charge lower rates, they do not have to cover such great territory as the Western Union and Postal companies do in this country, and, besides, he sad, English companies are being run at a loss.

"How do you account for the English companies operating at a loss while you make a profit?" asked Senator Davis.

"I put that down to American ability," was the reply.

Concerning control of telegraph companies by a commission, Mr. Mackay said he thought it might be proper for a public service commission to regulate the issue of bonds and stocks of the companies. He considered that, if experienced telegraph men comprised the commission, there could be no objection to the commission having power to control the construction of new telegraph lines. Otherwise, he said, he did not believe there ought to be any such authority vested in a commission.

Mr. Mackay estimated that eight per cent was a fair profit for a telegraph company to realize on its investment. He invited the committee to call at the Postal's cable headquarters at 20 Broad Street and witness the operation of the system.

It has just been decided to postpone until next fall the electrical show announced for Toledo, Ohio, January 31 to February 5.

January Meeting of the New York Section, Illuminating Engineering Society.

One of the largest section meetings of the Illuminating Engineering Society so far held in New York city, was held on January 20 in the Engineering Societies' building. E. L. Elliott presided.

The first paper, on "The Lighting of a Bowling Alley," by T. W. Rolph, was presented in abstract by Secretary A. J. Marshall, as the author was unable to be present. In this paper Mr. Rolph described the lighting equipment of five bowling alleys in the Brunswick Hotel, Newark, Ohio. Each alley is lighted by a row of eight forty-watt tungsten lamps equipped with Holophane D'Olier steel reflectors. The lamps are nine feet apart and nine feet above the floor, except the last lamp, which is five feet from the end of the alley and five and one-half feet above the floor to produce a higher illumination on the pins. The runways for the five alleys are lighted by two 100-watt lamps with Holophane intensive reflectors. The alleys appeared exceptionally well lighted. At first the illumination seemed low, but it is sufficient to illuminate a ball so that its movements can be seen distinctly. The pins stand out plainly against the dark background of the pit. The lamps are entirely hidden from the eyes of the bowler and there is hardly any noticeable glare on the surface of the alley.

This paper was followed by a lecture on "Selling Electric Light" by T. I. Jones, general sales agent of the Edison Electric Illuminating Company, of Brooklyn. By means of slides the author brought out various factors which enter into charges for electric current, referring principally to the equipment factor. One slide showed the rates for a fifty-kilowatt installation in the cities of Boston, Chicago, Philadelphia and Brooklyn; the curves were very close and showed that the readiness-to-serve charge was about the same in all these cities. Other slides were shown giving the various contract forms of the Brooklyn company's retail, wholesale, maximum demand, and flat rates. Mr. Jones stated that the advent of the tungsten lamp had tended to reduce the company's output and, in order to overcome this, great efforts have been made to obtain special power and long-hour lighting business, and by means of a subsidiary company placing tungsten lamps on an installment basis, some 1,700 former gas users are now using electricity, this having been accomplished in the past twenty months. The company has recently closed a contract for an immense sign on the water front, the letters being twelve feet in height and the sign 180 feet in length. The lamps are four-candlepower tungsten. The sign rate in Brooklyn is $2.75 per annum for four-candlepower lamps, and $4.00 per annum for eight-candlepower lamps. Signs burn from dusk to midnight and are maintained, lighted and extinguished by the company. The recent installation of tungsten lamps in Fort Greene Park, referred to in the January 1 number of THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, received favorable comment. A diagram giving the organization of the selling department brought out the fact that it comprised one general and two local officers, seventeen agents and various specialists.

In the discussion which followed Mr. Israel, agent of the Philadelphia Electric Company, said that his company had been most successful in opening local offices, having eight or nine at the present time. This he thought was necessary as the company covered 130 square miles of territory.

R. S. Hale, general agent of the Edison Electric Illuminating Company, of Boston, stated that while his company covered 500 square miles of territory it had obtained excellent results by closing the district offices, giving salesmen desk room and furnishing their consumers a free telephone service. However, he believed that a change back to district offices would be beneficial, as the essence of successful advertising was in a constant but slow change. Mr. Hale is a great believer in regular contracts and stated that during the past five years no special contracts had been made in the city of Boston.

Mr. Littlefield, of the New York Edison Company, stated that it was not good business for the central station to make a minimum charge and that everything should be done to enable the customer to obtain current without annoyance, and that a minimum charge was always a source of trouble to the customers.

He was followed by Mr. Moses, in charge of the illuminating engineering department of the Edison Electric Illuminating Company, of Boston. He stated that since September, 1908, applications of some 1,200 consumers for advice had been taken care of, and further, through the work of this department some 150,000 tungsten lamps had been placed. Referring to the value of show rooms he stated that if a company is going to have a show room, it must be a good one. In the main office in Boston during the month of December the sales of this one department amounted to over $10,000.

Mr. Macbeth, of the Welsbach Lamp Company, seemed to think that the question of rates as handled by the electric light companies was a matter of getting business and not one of seeking to please the customer and referred to several cases of seeming injustice that he had noticed.

Mr. Hanlon, of the Public Service Corporation of New Jersey, told of the value of canvassing, as in a small town in Michigan the electric company that employed a solicitor was wiring ninety per cent of all new buildings, and shortly after the gas company hired a solicitor it began piping ninety per cent of all the new buildings.

After further remarks by Messrs. Gardner, Graves and Merrill as to an easy method of explaining the readiness to-serve charge to the customer, the subject of the price of tungsten lamps was brought up by Louis Auerbacher, who stated that a grave mistake had been made in charging a higher price for the large sized tungsten lamps, for if they had all been placed on the market at the same price to the consumer he would have purchased the largest size in preference to the smaller and the benefit to the lighting company would have been correspondingly greater. He also called attention to the meagerness with which light is supplied for public lighting and the statement would seem to be justified by the discussion that followed by Messrs. Aplin, Marshall, Blackwell and Owens.

Western Electric Company Mortgages Property.

A mortgage of $15,000,000 has been recorded in New York by the Western Electric Company to cover the bond issue made a few weeks ago for the expansion of its business interests. The mortgage is held for the bondholders by the Merchants' Loan and Trust Company of Chicago.

While the mortgage covers practically all of the Electric Company's interests throughout the country, the recording of it in New York city only covered the property owned by the company in that city. The mortgage bears five per cent interest and is due December 30, 1922.

January Meeting, Chicago Illuminating Engineering Society.

The January meeting of the Chicago Section of Illuminating Engineering Society was held in the grill room of the Coliseum, Thursday evening, January 20. This meeting not only afforded the members an opportunity of discussing the timely subject of indirect illumination, which was the topic of the meeting, but also afforded an opportunity to view the many interesting electrical exhibits at the Electrical Show, which was being conducted in the Coliseum.

Following an enjoyable supper, Chairman Scheible called the meeting to order, and after making a few brief remarks introduced Frederick J. Pearson, who chose for his subject that phase of indirect illumination as related to maintenance.

Mr. Pearson said that a comparative cost of maintenance, as applied to the indirect system of illumination, must include first, cleaning of glassware and fixtures, second, renewals of glassware and fixture repairs, and third, renewals of the units employed.

Regarding the latter item the speaker said that the cost depended in each case entirely upon the type of unit under consideration, whether it be tungsten or carbon filament units, Nernst or arc lamps. The other two items were, however, treated fully by the speaker.

In discussing the cleaning of glassware and fixtures Mr. Pearson said that it is evident that the cost of maintenance per kilowatt-hour will be greater or less depending upon the monthly consumption of current per candlepower of units installed. Also the cost of cleaning will be influenced by the nature of the premises in which the system of illumination is used, the nature of the business, and the location. By way of emphasizing this last point, the speaker compared the amount of cleaning for fixtures installed in residences as against those installed in factories and shops.

Regarding costs, Mr. Pearson gave the following statistics as representative: The cost of cleaning and renewals in library buildings, three mills per kilowatt-hour, in residences five mills per kilowatt-hour; in theaters, three mills per kilowatt-hour; in churches, eight to fifteen mills per kilowatt-hour, and in factories four to six mills per kilowatt-hour. These figures were compiled, estimating the cost of cleaning on the basis of labor at $1.50 per day per man, cleaning once each month.

Regarding department stores the speaker was of the opinion that the cost of cleaning carried on systematically by janitors could be reduced to one mill per kilowatt-hour. This opinion, based on Mr. Pearson's experience, is significant, as he is electrical engineer in one of the largest department stores in the country.

Following Mr. Pearson, Dr. Henry Gradle gave a very interesting resume of the physiological and psychological conditions which must be understood when estimating the value of evenness and consistency in the distribution of light which obtains with the indirect system of illumination. Doctor Gradle likened the illumination produced by the indirect system to that of natural daylight, and explained the strain under which the eye labored when automatically adjusting itself to cover the wide range of retinal activity necessary when the light rays from bright sources impinged upon the eye with varying intensities.

George H. Jones followed Doctor Gradle, calling particular attention to several points respecting the efficiency of the indirect system, and stated that it was his opinion that the ideal system of illumination would include both the indirect system and direct lighting. He called attention to the cheerlessness of a room lighted only by an indirect source, and emphasized the necessity of establishing contrasts and color by means of portable and side-bracket lamps.

J. R. Cravath gave a very interesting summary of tests which have been made during the last four years, demonstrating the great improvement in the efficiency of the indirect system which has come about due to refinements in methods in manufacture and the adoption of high-efficiency lamps.

A. L. Eustice reviewed a number of tests which he had made of systems of indirect illumination, and called attention to the great necessity for careful and consistent cleaning of the glassware, these tests indicating that the absorption factor played a very important part in changing the efficiency of indirect lighting systems.

Prof. L. B. Spinney, who is inaugurating a course in illuminating engineering at the Iowa State College, Ames, Iowa, made some very interesting remarks concerning our present knowledge of the elements entering into the study of illumination. He emphasized the importance of a combination of indirect and direct lighting, calling attention to the illuminating value of sunlight on a bright sunny day. Under the bright sun there were sharp shadows and marked contrasts which made a landscape view a delight to the eye. When the sun was obscured by a cloud the landscape became flat and lost its charm for the eye. Under bright sunlight even very small objects when held close to the illuminated plane cast sharp shadows.

A. D. Curtis on closing the discussion, called attention to the great popularity with which the indirect system of illuminating has been received. A few years ago he had believed that in order to make this system popular it would take a long period of education, but that this had not been the case. He emphasized the fact that with the system which uses a unit reflector and a high-efficiency lamp placed within the confines of the reflecting surface, that the light really came from the ceiling, and that while there was consistent diffusion, there were enough straight rays to cast fairly sharp shadows. Respecting the maintenance, other than that of cleaning, which should not be greater than that in any other system of lighting properly taken care of, it was his opinion that the maintenance charges for breakage and for labor were low.

International Congress of Mining, Metallurgy, Applied Mechanics and Practical Geology.

The provisional scientific programme of the various sections of the International Congress of Mining, Metallurgy, Applied Mechanics, and Practical Geology, which will assemble this year at Düsseldorf, in Rhenish-Westphalia, Germany, has recently been issued. It is announced that the meeting will be convened during the last week in June, and among the electrical topics which will be discussed are: The driving of rolling mills considered technically and economically (steam, gas, electricity); central electric-power stations (*a* steam and gas reciprocating engines; *b* turbo-engines); electric winding engines; conveyors for mining and smelting works. Other sections will also undoubtedly contain material of electrical interest.

Chicago Electric Club.

As has been the custom for the past few years, during the Electrical Show, the Chicago Electric Club met in the restaurant of the Coliseum on Wednesday, January 19, as the guests of the Chicago Electrical Trades Exposition Company.

Following the luncheon President Frederic P. Vose called the meeting to order and introduced Vice-President Homer Niesz, who, as managing director of the Electrical Show, delivered a cordial address of welcome to the members and their guests.

Frank L. Perry, who has been instrumental in inducing the government to exhibit the Wright aeroplane at the show, and who has been closely associated with the work of equipping the craft with a wireless telegraph outfit, was called upon. He briefly reviewed his work in connection with obtaining the exhibit, dealt with the opportunities thus afforded the visitors in seeing in actual operation this interesting wonder, and in his customary eloquent style introduced the speaker of the day, Lieut. Ben D. Foulois of the United States Signal Corps, who is in charge of the aeroplane exhibit.

The countries of Europe, particularly Germany and France, have for several years past been experimenting with and developing the aeroplane and dirigible balloon. The United States has been handicapped in this respect by reason of Congress failing to make suitable appropriations for carrying on the work. Lieutenant Foulois, however, defended the Government against the criticism it received by delaying for so long a time the purchasing of the Wright aeroplane and the further developing of this branch of work.

The aeroplane has two superposed surfaces, in rough dimensions about eight feet apart with a spread of about thirty-eight feet and a distance of about eight feet from front to rear. The surfaces are so constructed that their extremities may be warped at the will of the operator. The speaker explained that the planes in front of the machine were the means of raising and lowering it and the tail in the rear for facilitating the steering.

Lieutenant Foulois spoke very highly of the engine which was designed by the Wright brothers. It is a four-cylinder, water-cooled engine and develops from twenty-five to thirty horsepower, running at a speed of 1,400 revolutions per minute. There are two wooden propellers, six and one-half feet in diameter which run in opposite directions at a speed of from 375 to 400 revolutions per minute. The fuel capacity of the engine is twelve and one-half gallons and according to the speaker this is sufficient to operate the aeroplane over a 125-mile radius for three and one-half hours, carrying a weight of 350 pounds, or two passengers. Carrying one passenger the craft could operate ten hours on one supply of fuel.

While the speed of the aeroplane averages forty miles per hour, Lieutenant Foulois said that the engine could be stopped and the craft soar to the ground at a speed of about thirty miles per hour.

He spoke of the value of the airship in time of war, its principal function being for reconnaissance and photographic work. Dispatch work, signalling and wireless telegraphy were also mentioned and Lieutenant Foulois' opinion is that in future wars the enemy will also have air crafts and battles between these fleets are likely.

Regarding equipping the aeroplane with a wireless telegraph outfit the chief objection found so far, namely, the noise of the engine, interferes with the use of headpiece for receiving messages. This, however, can be overcome by either providing a suitable muffler for the engine or using the tape recording system of receiving messages.

Following the address the report of the nominating committee was read by A. A. Gray, which recommended the following slate:

Frederic P. Vose, president.
Homer E. Niesz, vice-president.
F. S. Hickok, secretary.
F. J. Postel, treasurer.

For the Board of managers: A. A. Gray, W. E. Keily, Robert E. Mitten, Geo. H. Porter and E. R. Rockwell.

President Vose called attention to the booklet which is being distributed to the members. It contains a copy of the by-laws of the club and in addition a complete list of all members, giving their business address and telephone number. It was compiled by A. A. Gray and has been presented to the club by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. Announcement was also made that the Electric Club smoker held recently resulted in $30 being added to the treasury.

The Personnel of the Chicago Electric Club.

The Chicago Electric Club was formed nearly four years ago as a successor to the old Chicago Jovian Club. When the Jovian Club practically ceased to exist there was a small sum of money in the hands of the executive officers, and with this as a nucleus, the Chicago Electric Club was formed with about twenty-four members. Since that time, under a vigorous administration, it has thrived and grown, and now, at the close of its third year, it is in a flourishing condition, both as respects its financial condition and the spirit of harmony which exists among its members.

A feature of the club's work is the Wednesday noonday session, at which time some speaker, a leader in his field, addresses the club on some timely topic. The club has been particularly fortunate in the wide scope which these addresses have covered and the standing of the men who have appeared before it.

The club now has a membership of some 450, and at a recent meeting a resolution was enacted limiting the numerical roster to a membership of 500. The club is thoroughly representative of the great electrical industry in the West, and it is steadily growing as an influence in commercial and civic matters relating to the city of Chicago.

Frederic P. Vose, president, has long been a resident of Chicago, and is one of the leading spirits of the Chicago bar. He is secretary of the Electrical Trades Society, and is a valued adviser of a number of large public service corporations. Filling out the unexpired time of C. A. S. Howlett, who resigned several months ago because of his removal to another city, Mr. Vose has made an energetic and capable president. The meetings are always enlivened by his sparkling wit and quick interjections or repartee to dress up a dull moment.

Homer E. Niesz, vice-president, is manager of the Cosmopolitan Electric Company. Mr. Niesz is an executive of great ability, and frequently in the absence of the president conducts the meeting with dignity and grace. Mr. Niesz is also manager of the Electrical Trades Exposition Company, and each year the Electric Club is the guest of the Electrical Show at the Coliseum.

William S. Taussig, secretary, has served the club with great fidelity and

has secured for the secretary's office a very complete record of membership and a valuable set of historical data respecting the meetings of the club. Mr. Taussig has been well known in Chicago for a long time, as a manufacturers' representative, as a copartner with Fred R. Babcock in the firm of Taussig & Babcock, and is now connected with the sales department of the General Electric Company in Chicago.

James G. Pomeroy, treasurer, has indeed been the "watch dog" of the treasury. Under his efficient administration the collection of dues has been attended to with exacting regularity, and the club is in a remarkably well-established financial condition. Mr. Pomeroy is one of the best-known manufacturers' representatives in this part of the country, and for eighteen years has had charge of the Chicago office of the Adams-Bagnall Electric Company, of Cleveland, Ohio.

F. S. Hickok, manager, and chairman of the speakers' committee, has done remarkable work in the securing of notable men to address the gatherings. His direct supervision of the speakers' list and the preparation of announcements has been responsible for a large measure of the success to which the club has attained. Mr. Hickok is the Chicago representative of the Ridgway Dynamo and Engine Company, of Ridgway, Pa.

S. F. Dibble, manager, and chairman of the finance committee, is a well-known engineering salesman and manager of the small motor department of the General Electric Company. Mr. Dibble takes an active part in the meetings of the board of managers, and has done good work in the interest of the club throughout his term of office.

H. F. Holland, manager, and chairman of the membership committee, is largely responsible for the great increase in membership which has come during the past year. He is a popular representative of the Chicago office of the Pacific Electric Heating Company, of Ontario, Cal.

J. J. Schayer, manager, and chairman of the entertainment committee, has been an active worker and has provided the club with a number of first-class entertainments, being assisted in this work by George H. Porter, of the Western Electric Company, and R. M. VanVleet, of the Cutler-Hammer Manufacturing Company. Mr. Schayer is connected with the Commonwealth Edison Company, and is in charge of the beautiful "Electric Shop" at the corner of Michigan Avenue and Jackson Boulevard.

The remaining member of the board of managers is A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and chairman of the house committee.

Frederic P. Vose, President.

Homer E. Niesz, Vice-President.

William S. Taussig, Secretary.

James G. Pomeroy, Treasurer.

F. S. Hickok, Manager.

S. F. Dibble, Manager.

J. J. Schayer, Manager.

H. F. Holland, Manager.

OFFICERS AND MANAGERS OF THE CHICAGO ELECTRIC CLUB.

Charlotte Meeting of the A. I. E. E.

Preliminary announcement was made in these columns last week about the special meeting of the American Institute of Electrical Engineers to be held at Charlotte, N. C., in the latter part of March. It has just been decided to postpone this meeting one week, so that the dates will be March 30 and 31 and April 1, 1910.

Wisconsin Electrical Association.

First Annual Convention at Milwaukee, Wis., January 19 and 20, 1910.

The first annual meeting of the Wisconsin Electrical Association held at the Hotel Pfister, Milwaukee, Wisconsin, January 19 and 20, fully demonstrated the success with which the recent amalgamation of the two electrical associations has met. It will perhaps be remembered that the Northwestern Eletrical Association merged with the Wisconsin Electric and Interurban Railway Association under the name of the Wisconsin Electrical Association at a meeting held last June. Since then there has been an unquestioned increase of interest on the part of the old members of both societies and the 150 men who met at this convention showed by their enthusiasm that the influence of this organization in electrical affairs is going to be very marked.

THE WEDNESDAY MEETING.

President Gonzenbach opened the meeting at 10:30 Wednesday morning and general business was carried on. Several very encouraging reports regarding membership were given by members of the membership committee. Mr. Gonzenbach spoke of the great desirability of reaching some of the managers of power plants operated in conjunction with flour mills. This class of prospective members is very desirable though hard to reach.

SECRETARY ALLEN'S REPORT.

As a result of very liberal subscriptions following the amalgamation at the June meeting there is a considerable balance left in the treasury after paying all bills. Although all parties have co-operated and have done everything possible in furthering the interests of the association there is yet much to be done.

By an extension of the feeling of dependence on each other and by the feeling that each member has the whole association back of him, the influence of the body is bound to become greater. Thanks should be given to those who have subscribed so well for the good of the association.

Mr. Gonzenbach remarked in commenting on this report that this, truly, was the first time that the members of the Northwestern Electrical Association had been able to feel that their society was out of debt. The remarks by Mr. Gozenbach were followed by the presidential address, from which the following is taken:

PRESIDENT'S ADDRESS.

We are meeting, here in Milwaukee, for the first time as the Wisconsin Electrical Association, and it can hardly be denied that such an association as this has been long needed.

Although the field has been covered by the Northwestern Electrical Association, the present society bids fair to be a much stronger body. The history of this former society would be interesting but unfortunately there are no records. There is not even a list of members.

On the other hand, the Wisconsin Electric and Interurban Railway Association had complete records and was strongly organized.

This body was organized because it was absolutely necessary that something should be done to hold the railway men together. Hostile legislation imperiled the electric railway interests of the state, and for mutual protection about twenty-five men met and organized the association. Though the membership was small much was done, and it can only be hoped that the present society will be a worthy successor.

So strongly was I in favor of dissolving the Northwestern Electrical Association that it was indeed a surprise to find myself elected president of the amalgamated societies. It was, perhaps, in the hope that the society would either entirely fail or come out in good shape. It was necessary that something should be done. The books of the Northwestern association were in bad shape, several hundred dollars was owing. Proceedings had not been published.

Considering the very different financial condition of the two societies it is not surprising that the movement to amalgamate was voted down a year ago. It is rather more strange that the affiliation was brought about at the Waupaca meeting last summer. At that meeting subscriptions were started and more than $500 collected for the purpose of liquidating the Northwestern debts. All these subscriptions were of course contingent upon the consolidation of the two societies.

At future meetings of this society an enormous amount of work remains to be done. Papers will be submitted on operating as well as on engineering problems. There has been too little attention given to the real problems of operating at past meetings. Sometimes engineering papers were considered almost in exclusion of the operating questions. Much in finance also remains for discussion.

Wisconsin has never been a good market for electrical securities, for there seems to be a lack of confidence on the part of the Wisconsin investors. Nearly all the corporations are financed outside of the state. Perhaps this is through a fear of what the changing political conditions may do to a corporation, and corporations and politics are far too closely related. It is a lucky corporation indeed which can keep out of politics beyond the limits of its franchise. Some of the franchises require ridiculous performances on the part of the corporation and over-zealous mayors and councilmen sometimes try to enforce clauses which changed conditions have made obviously impossible.

Regarding kind treatment by the Railroad Commission the association has, perhaps, been too enthusiastic. While we respect the Railroad Commission we do not ardently love it and the public has perhaps already said that since we are so friendly, we must be partners in iniquity. The law (not the commission) is the real seat of trouble, and this has given the commission power beyond its real powers. Money spent uselessly in complying with some of its regulations could be spent well and with much benefit to the public. It is not because the railroad company wants money that straphangers exist, but because the commission requires an exorbitant amount to be spent in paving which it does not use and in other ways.

Many lighting companies have been asked to extend their lighting service but owing to the heavy taxes of the commission, city, state and other sources, have been unable to do so.

I do not mean that a company should not pay its just taxes, but I do say that some of the taxes are without justice. It should be remembered that whatever taxes are levied the ultimate consumer must pay them in some way. Some politicians have been celebrating over the decrease of railroad fares, but the shipper pays higher freight bills and the consumer in turn pays the shipper.

The United States Government has recently added another burden in the shape of a corporation tax, but this, which is one per cent of the net profit, is not so bad as the other taxes. It is the ward heelers and the "peanut politicians" who exact a tax of eight or ten per cent in one form or another.

In conclusion it might be said that this association needs some political reform and we have followed practices which we are ready to condemn in the Government. Our officers instead of being elected for only one year and scattering out, should be elected as they are in some other societies. There should be a president and four vice-presidents. Each year the first vice-president could take the president's place, and each year a new fourth vice-president would be elected. There is also great need of a permanent secretary with a salary. These steps for permanency are necessary to bring the association to its highest efficiency. Moreover it is necessary that we stand together. We have so far prevented the passage of a law seriously injuring our interests; but eternal vigilance is necessary.

GENERAL BUSINESS.

The reports of the committees were omitted to proceed with the reading of papers. Irving P. Lord, of Waupaca, made a motion that the president should name a committee of three members to appoint officers for the coming year. One of the requirements of membership to this committee was that the man should not have held any office previously.

INVENTORIES.

W. R. McGovern, engineer of the Wisconsin Telephone Company, read a very interesting paper on "Inventories," in which he treated quite fully the methods of arriving at the value of an existing plant.

The taking of inventories of this kind is divided into two parts, the field survey

and the office computation. This field survey is generally made by a corps of engineres and consists in counting the amount and type of the plant. Here the present value is arrived at. The question of ages of the different parts are also estimated.

In counting the plant the value of land is first considered, this being arrived at by finding a ratio with the assessed value of the surrounding land. Should the land have been bought in small pieces an additional ten per cent is added. Plans of the buildings are then gone over, and the price of reproducing obtained from various contractors. For the equipment price lists may be used. The material is then divided into groups according to the year of installation and all insulators, etc., are checked against installaton orders.

The outside work, such as poles, is indicated on a map. All details as to painting, cross arms, are noted on the plan. Estimates or actual measurement are resorted to for pole sizes. The wire on each line is noted, drops, working and idle, are counted and the average length estimated. Copper wire is measured with a tape. Cable is measured with proper allowances, and the cost of replacing the pavement is obtained from contractors.

In the office work which complete the estimate, prices are arrived at by a careful examination of fluctuation for several years. After that, depreciation is computed. No material still in service is depreciated below the service value, and the scrap value is deducted wherever possible. Charges of storage and handling have also to be added to reproduction value.

For general office expense pertaining to construction ten per cent is added to the other expenses. To cover depreciation on tools about two per cent per month must be added. Another twelve per cent covers insurance and exigencies.

In discussion of the depreciation of plants Mr. Duffy, speaking of conditions in Milwaukee, said that when John I. Beggs took charge of the Milwaukee Electric Railway and Light Company conditions were such that operation was impossible. Mr. Beggs stated that $15,000 per month was necessary to put the railway on its feet. That was ten per cent of the gross earnings of about $1,800,000. Arbitrarily charging $15,000 per month was dropped and ten per cent of the earnings was afterward charged. This was charged to expenses instead of being deducted from the income. He said further that the expenses were divided broadly into current and uncurrent or extraordinary expenses. The un-current expenses are charged against the depreciation reserve. Repairs to track, for instance, come directly under maintenance, but when it finally becomes necessary to tear up the track and replace it, this must be charged to depreciation. There should be a sharp line drawn between renewal and depreciation and the total renewal of a section of trolley line is in no sense depreciation.

As to the amount of depreciation, the largest amount that can be spared is generally not sufficient to cover the expenses.

Mr. Duffy's discussion opened up the way to a general talk on the subject of the expenses incurred by a company in the process of development, after which the meeting was adjourned to reopen at 2:30 p. m.

AFTERNOON SESSION.

In continuation of the morning's discussion the remark was made that it seemed odd that the depreciation should be based on gross earnings rather than on actual cost of replacement. Mr. Duffy replied to this by saying that the only scientific manner in which depreciation could be accurately determined was by age, conditions of use, action of the elements, etc. There is, however, a close relation between gross expenses and depreciation, for the wear and gross earnings are closely related.

T. Commerford Martin, executive secretary of the National Electric Light Association, in speaking on the same question, said that this had not as yet come up before the association for consideration, but no doubt soon would be investigated. At present all attention is being taken up by a consideration of the national corporation tax, regarding which it is hoped that the national associations will soon all adopt the same views.

COMMITTEES.

After the close of this discussion the names of the committees were announced as follows: Auditing committee—T. A. Pamperin, H. A. Miles and H. G. D. Nulting. Nominating committee—Dudley Montgomery, B. D. Viles and W. R. Putnam.

ELECTRIC AUTOMOBILES.

O. M. Rau, electrical superintendent of the Milwaukee Electric Railway and Light Company, read a very interesting paper on "Electric Automobiles," treating the subject from the standpoint of the central station manager.

The load factor of a plant and its dividends are closely related, and that this load factor is high is necessary to the profitable operation of a plant and is vital beyond anything else. The electric vehicle offers an admirable solution to this problem, and it is not surprising that this is so as one electric vehicle is equivalent to at least fifty flat irons. It is strange, indeed, that more central stations have not actively pushed their electric vehicle business. Such a load is bound to be beneficial and profitable to a plant. The education of the public can do much in this line, and this is in fact the one way in which the electric vehicle may be brought to its greatest usefulness.

Special attention should be given to charging apparatus and the customers should be encouraged in charging their vehicles at home instead of going to a garage. As a record of the growth of the electric automobile load in Milwaukee, the following data were given. In 1906 there was a total of six customers bringing in $200. In 1907 this had increased to seven customers, with an income of $500. A year later there were thirteen customers and $1,200 worth of power was used, while during the past year there were twenty-nine customers consuming $4,200 worth of power for charging their storage batteries

These private charging stations gave excellent economy. The maximum bill for a coupe was $48, the minimum $4.75, and the average $7.51 per month. This cost compares very favorably indeed with the cost of keeping a team of horses, while as to convenience the automobile is much in the lead. Solicitors can urge the use of electrics on the grounds of economy and from the standpoint of convenience there can be no opposing argument.

Before recommending electric vehicles for general use the contour of the city should be carefully considered. It is useless to promote them where the city is extremely hilly or has poor pavements or very muddy streets. In some cases automobiles have been seen standing at corners where the pavement ended, as the unpaved streets would not permit of the vehicle being taken to the private garage. In such cases charging on the owners premises is obviously impossible, but on the whole the case of private charging stations cannot be too strongly recommended.

Trouble of serious nature in electric vehicles is extremely rare, and generally trouble of any kind can be traced to the motor and not to the battery. The simplicity of the method of charging and this lack of liability of trouble offers another reason why the customer can attend to charging his own batteries with satisfaction to himself.

As to making any special rates for the power consumed by owners of electric vehicles it is hardly desirable that this be done. It is true that this load is extremely desirable and that it tends to level the load curve, still it is unwise to place restrictions as to the time of charging, without which restriction charging may take place when the load is already high.

The electric vehicles are so desirable in themselves that there seems to be no reason why every power vhicle in a well-paved city should not be electrically driven without making any special concessions as to the price of power.

In the discussion that followed this paper the question was raised as to whether mercury arc rectifiers should be used in charging. Many of the members have found them extremely satisfactory in service. Mr. Wheeler's question as to whether some scheme could not be devised to keep the charging load off the peak load was answered by Mr. Rau, who said that while clock meters used in connection with a system of reduced rates at certain hours would do it, this method was not altogether satisfactory. Such a scheme tends to restrict the use of current, and any plan doing this is bad for the central station.

It was suggested the poor pavement was the thing that is acting most in restriction of the electric automobile

use. When roads are improved there will be no question of the supremacy of electrics.

Speaking further on the subject of pavements T. Commerford Martin deplored the condition of the pavements in New York city. In this respect that city has much to envy some of our western cities. A man who rides in a taxicab or coupé in New York does so very often at the risk of life and limb.

It was brought out that as to price, ten cents per kilowatt-hour is undoubtedly too high to allow of much development of the electric vehicle. It would be better to sell cheaper and thus use the surplus capacity of the plants at a time of low load.

The development of the business rightly belongs in the hands of the central station manager rather than the automobile man or garages. To this end the Rochester, N. Y., Railway and Light Company has established a garage where it takes entire care of the electric automobiles which they supply with current. At present an approximation of the number of electrics used in the United States is about 20,000, and of these 4,000 went into service only last year.

Mr. Rau at the close of the discussion stated in answer to a question that his company made a minimum charge of $5 per month for a five-horsepower vehicle, their rate running from eight to three cents per kilowatt-hour.

HANDLING COMPLAINTS.

Following the discussion of Mr. Rau's paper W. M. Putnam, superintendent of the Menominee-Marinette Light and Traction Company read an excellent paper on the subject of "Handling Complaints."

There are in general two classes of complaints which come in to the average operating company; complaints that are reasonable and worthy of investigation and complaints that are absolutely without foundation. These latter come mostly from mere principle. Only one method can be followed in either case, and the company should satisfy the complainant or show wherein his objection is without cause. One customer who objects and still continues to use current is a great damage to the company.

To show the public that the company intends always to act justly, a complaint clerk should be installed in every office of any size. It is rather bad to have the cashier attend to this, as the public sometimes has the idea that the man who takes their money embodies all that is bad in the corporation. This complaint clerk should be an optimist and he should receive personally each complainant and give courteous attention to his case. The clerk should be acquainted with the lighting system and show the customer what is being done to eliminate the source of trouble. If with this the customer is not satisfied, it only remains to take the matter up with the operating department. If the trouble is on the customer's premises the expense of fixing it may perhaps be shared with him.

Bill complaints are of extreme frequency and for this reason it is necessary to keep all bills for some little time. Many times the customer has no cause for complaint, and by showing him former bills he may be made to see that the charges are not at all out of the ordinary. Should this not satisfy him the clerk should get a list of the number of lamps and the periods they burn, showing him just where the expense came. Should he be satisfied then, a letter may be secured stating his satisfaction with the service. Such letters are sometimes very useful.

Some companies adopt the system of visiting a customer not less than four times a year with no object in view other than finding whether they are satisfied with the service the company is giving. Such treatment makes friends for the company and brings enough good feeling to fully compensate for the time spent.

There is one rule, however, that can not be overlooked, and that is in regard to discounting bills after the discount date has passed. It is the habit of some customers, as you know, to pay their bills after the time has passed and still ask or demand their discount.

The cashier of a company should never be allowed to give discount on lighting or power bills after the discount date. It is the practice of the company which Mr. Putnam represents for a complaint man sometimes to pay the discount out of his own pocket, making the customer pay the cashier in full. This makes rather a personal matter of the payment, and brings about better feeling between the customer and the company. An objection was made that the department handling complaints should not be called "complaint department," and that it might be better to call it an "information bureau," and thus not impress the idea of complaint on the customers. Some companies have a man whose duty it is to see that no person leaves the office after paying a bill unless they are entirely satisfied with the bill and with the service.

Complaints as to voltage may be substantiated by the use of the recording voltmeters on different parts of the service lines. Mr. Winslow in commenting on this paper stated that it was a practice of his company to give one-half of the regular discount rate up to the 25th of the month. This seems to suit the customers much better than having no discount at all, and certainly saves many collections.

Harold Almert, of H. M. Byllesby & Company, Chicago, outlined a system for inducing the customers to pay before the discount date has passed. A list of delinquent customers is made and each one of these is called up by telephone and informed that his bill is due and that unless it is paid he is liable to be put on the delinquent list. He is made to feel that the representative of the company has called him up especially to save him money, and the scheme works very well indeed. It has even been carried to such a point that the manager has paid the bill out of his own pocket, and allowed the customer to pay him later.

Mr. Putnam, contrary to the objection that had been raised regarding the name "complaint department," said that it might be somewhat better for this to be called "complaint department," as the general public rather likes to have a corporation acknowledge that its employees are human. Several managers of smaller companies discussed the question of discounts, and while the general opinion was that while these were necessary for the prompt collection of bills, there were a few central station managers who thought that their bills were collected with as little expense by personal solicitation.

M. C. Ewing, of Wausau, has put in use a system of collections involving a small penalty charge. There was formerly a meter charge which did not seem to be entirely satisfactory. In place of this there is at the present time a penalty of twenty-five cents per month for the non-payment of bills regardless of their size. The plant where this scheme is used has about 1,200 customers.

Mr. Wheeler in speaking of the minimum charge for lighting said that he did not see how a company could have so low a fixed charge as twenty-five cents. He did not, indeed, see how this could well be below seventy-five cents and invited a discussion on this point. In support of this Mr. Almert held that a $1.00 minimum charge was not unreasonable, and in nine cases out of ten that would not cover the expense. In some companies operating in towns where gas is used there is a tendency on the part of the customers only to use the electricity in case of emergency, or to save lighting a match, and while their connected load is high their bill may be the minimum nearly every month, except on occasions where the entire connected load is thrown onto the station.

The system of ideal charges evolved by Mr. Winslow is worthy of study on the part of the central station managers. According to his system for lighting there is a fixed charge of fifteen cents for each fifty watts of maximum demand, plus four cents per kilowatt hour used. The maximum demand for residences is to be fixed by taking the first 250 watts connected load at 100 per cent, the next 250

watts at thirty-three and one-third per cent, and all over 500 watts at sixty-six and two-thirds per cent. For business places the fixed charge is the same, but the first 500 watts is rated at 100 per cent, the next 500 at eighty per cent, and all over 1,000 at sixty per cent.

ELECTRIC RAILWAY FARES.

A paper on eletric railway fares was read by J. F. Pulliam of Oshkosh, Wis., which dealt with some of the difficulties with which the electric railways have had to contend since the establishment of the Railroad Commission.

In the application for franchise made by a new company the promoters often overreach themselves and promise too much. Many conditions, such as six tickets for twenty-five cents, workingmen's tickets, school tickets and other special inducements are agreed to. With these rates it is often necessary to operate a railroad at a real loss, and several companies have not only increased the fare from five to six cents, but are thoroughly investigating the question of transfers. In Oshkosh, workingmen's tickets are still sold, but it is very questionable whether this is good policy. Fond du Lac gives six tickets for twenty-five cents, and furnishes special cars for workingmen. There are, however, no transfers. Bargains given by railroad companies in the form of special cars for picnics, socials, etc., are often given at a loss. Some rates which are made for these occasions are ridiculous. One car which was rented for $10 carried 167 passengers. The rate at ordinary times should, if anything, be higher than they are on the parallel steam roads.

When rates were raised on a certain Wisconsin road which is used as an example, the number of passengers fell off to a very small extent, and the income of the line increased considerably. This line is at present operating with the raised rate, and in spite of the boycott of the farmers through whose territory the line passes the number of passengers still remains about the same. Merchants formerly held excursions, but owing to general dissatisfaction on the part of everyone except the merchant who ran the excursion, it was an excellent thing when the state commission ordered such excursions abandoned.

The only way in which a line can be made popular and profitable is through regular service, good schedule, politeness on the part of the employees, and an effort to show to users of the line that everything is being done in their interest.

A discussion followed as to the methods which had to be pursued by a company wishing to raise its rates. It is necessary, according to M. E. Ewing of Grand Rapids, Wis., to file notice for the commission thirty days in advance of the action being taken, and if no objection is raised within that time the rates go into effect. Should objection be raised the manager of the company is called before the railroad commission and the matter of rates is decided there. No notification is generally given to the company by the commission unless they are to be called to explain.

THURSDAY MORNING SESSION.

The Thursday session of the convention was opened by a paper on cooking and heating by electricity, by W. B. Voth, general superintendent of the Sheboygan Light, Power and Railway Company. The object of this paper was to show how the central station might be most benefited by the use of cooking and heating utensils.

The field covered by these applications might be divided into three separate classes: Cooking and baking utensils, air heating and commercial heating appliances. As electric power is a secondary form of power it is necessary that the cost of this should be greater than the cost of heat obtained from primary sources, but it is through cleanliness and convenience that these utensils are finding public favor. The electric flat iron is an exception to this, and if the cost of doing a piece of ironing is taken as a unit it cannot be disputed that electric heat is the cheapest. Now that public interest is being awakened great progress is being made in the manufacture of electric appliances, and it only remains to find some method of preventing the waste of the heat. In articles such as the frying pan, teakettle and some other devices with self-heating elements improvement can be made, as the device is heavy and often clumsy and hard to clean. A better solution would be a disc enabling the cook to take off the utensils for cleaning.

To determine the cost of operation of various utensils and to see to what extent the current demand would effect lighting regulations during the December peak, the writer installed in his house a complete kitchen outfit, and made a trial of each individual article. The utensils used were as follows:

	Watts.		
One oven, three heat	550,	1100,	2200
One 7-inch frying pan, two heat.	220,	575	
One 10-in. frying pan, three heat.	325,	650,	1300
One grid, three heat	225,	450,	900
One broiler, three heat	265,	800,	1200
One percolator, 4-pt., one heat	500		
One one-pt. hot water heater	400		
One two-qt. combination cooker	250,	500,	1000
One toaster, one heat	600		
One flat iron	600		

The oven in baking a cake required thirty minutes with a consumption of 353 watt hours. It may be seen that this method is quite expensive, and that such ovens would find a very limited field with the average central station. The frying pan was quite successful, and even more efficient than the grid, and it seemed that the smaller frying pans were even more satisfactory than the larger ones. In fact, the same amount of bacon that was cooked in a ten-inch pan at one time could be cooked in two parts in a seven-inch pan with less current consumption. Each one of the other devices was tried and a record taken of the power consumption. A trial was also made of the cost of cooking different meals. It was found that a breakfast consisting of cereal, toast and coffee was prepared with 260 watt-hours. The addition of eggs brought the consumption to 300 watt-hours. A dinner of broiled steak, baked potatoes and coffee would require 2,450 watt-hours.

It appears from the average of a very large number of experiments that if the cost of current is more than the cost of 18 cubic feet of gas, then gas is the cheaper heating element, otherwise electricity is the more economical. This means that with gas at $1 electricity must sell for about two cents per kilowatt hour. While this is hardly possible, the very great advantages of cleanliness and convenience make the heating devices exceeding popular.

The electric fireless cooker is one of the latest developments in the electric heating field, and it is believed that it will be more welcome than the present high current demand utensils for the reason of much greater economy. The difficulty here seems to be in the automatic control or shutting off the current when a sufficiently high temperature is reached.

The sale of heating and cooking devices seems to be the work of the central station rather than of the electrical contractors and department stores as the central stations are more in a position to push the educational features of electricity. When the time comes that the public thoroughly understands electric devices then they can select these from stores the same as they do other cooking utensils, and the central stations will doubtless be glad to turn the sales over to them and devote themselves merely to the sale of electric current.

It has been stated that the average current consumption by a family of four for cooking purposes is eighty-four kilowatt-hours per month, which seems a little low. Since the capacity demand of a cooking outfit is considerably greater than that of the resident customers it is quite desirable to keep this load away from the factory lighting peak. It is found in general that the electric kitchen load comes a little before the factory peak load. The cooking in the winter months will doubtless affect the lighting regulations in the morning hours and to a great extent in the evening, and for that reason the best time for the central station men to push electric utensils is in April, May, June, July, August and September.

If the central stations would introduce into every home one of the devices at a time it would aid materially in increasing the residential power service, and a satisfactory use of one utensil would doubtless lead to the installation of more.

The writer has also made several experiments with air heating, but found this to be rather expensive except for the temporary heating of a bath room or for heating for a short time on cool mornings or evenings.

Commercial heating articles, such as shaving mugs, corn poppers, and heating pads are a very good source of revenue. In a tinsmith shop where a soldering iron is used, the average income amounts to approximately $2.50 per month. Many electric heating devices are used in special trades. Glue pots, special leather working tools are much used and there is even a device especially designed to mark cheese so that it may be cut into one-pound sections without loss.

J. R. Cravath, of Chicago, gave some of his personal experiences as to cost of using electric cooking devices. In common with many others he believes that the future of electric cooking lies with the development of a satisfactory fireless cooker. One of these devices is being manufactured in a factory in Janesville, Wis., and experimental work is being conducted, but no results have been made public up to the present time. President Gonzenbach added that he would like to hear from some of the manufacturers as to the basis of costs of electric cooking devices which he thought enormously high. There were unfortunately no

manufacturers in the room at the time. Discussing the possibility of competition of electric companies with gas companies for heating and lighting business, Mr. Almert cited the case of a plant which was in danger of going into bankruptcy through competition with a gas plant. An educational campaign was conducted and a show given exhibiting the heating devices and showing people what could be done with electricity. This was a material aid in putting the company on its feet again.

A fireless cooker was produced by Mr. Sterling, which device he claimed was the only one in existence. He manufactured the cooker himself, using a 350-watt heating element, finding this more satisfactory than the 800-watt element fused in a former trial. The oven has a thermostat control, and is to be equipped with a fusible plug.

Several valuable points were brought out as to the ways of improving the construction of heating devices.

T. Commerford Martin, executive secretary of the National Electric Light Association, congratulated the Wisconsin Electrical Association upon its reorganization, and spoke briefly of the history of the body of which he is secretary. He laid special stress on the importance of the development of the motor load and power load by the central stations, a thing for which the National Electric Light Association has always worked.

The growth of this body has been very steady for several years, but during the last few months they have had an increase which has been unparalleled among societies. The membership increased in this short time by 1,200 members, so that there is now a total of 4,500 members, a fact which gives evidence of the great prosperity of the electrical industry. This growth he attributed in a great measure to the efforts of Mr. Scott.

As to the work of the National Electric Light Association; it depends largely on its publications, by which an enormous amount of good is being done. A recent issue of the Electrical Engineers' Hand Book was so popular that 4,500 copies were printed, and later an additional 500 had to be printed. A new edition is now being produced.

The membership of the association is divided into five classes, consisting of operating companies, employees of these companies, engineers, manufacturers and manufacturers' employees, so that the society is extremely democratic. By virtue of their association and co-operation men in all these classes can be raised to the highest efficiency and can be of great mutual assistance. Information of nearly every nature is given to the members, and there has even been an insurance man retained to give opinions regarding grounding of secondaries and other important points.

A booklet has recently been compiled containing the rules and regulations on signs. Twenty or thirty standing committees, comprising about 150 of the leading central station men of the country have in charge the compilation of sections of the hand book relating to meters, conservation of water power, treatment of poles, uniform accounting, and several other subjects. By standardization of matters pertaining to power plants the association will no doubt have great influence with the public service commissions. Uniform legislation is a necessity, and this matter is at present being looked after in Washington.

The National Electric Light Association is slowly coming to a federal basis. The constitution provides for affiliation with such associations, and opinions are being sounded as to the establishing of societies of electrical men in nearly every state. There are three general sections at present; New England, Pennsylvania and Vermont. Company branches are also being planned and should be encouraged, as the meetings are productive of the greatest benefit. A company or state association may be compared to an isolated plant unless it is affiliated with some national body. When such affiliation takes place the members and officers who have given their time to this cause will feel amply repaid.

Mr. Gonzenbach was highly in favor of such an affiliation, and remarked that it seemed to be the general tendency. The Wisconsin Electrical Association contains men interested in street railways, as well as in power, and it may be that in time the association will be united with both the American Street and Interurban Railway Association, and the National Electric Light Association.

On Mr. Almert's motion a committee was then appointed by the president to look into the matter of affiliating with the national bodies.

Owing to the absence of W. J. Kelsh, master mechanic of the Wisconsin Electric Railway Company, a discussion on the subject of wheels and axles was substituted by Mr. Gonzenbach. He particularly referred to the increase in the size of standard wheels, axles, flanges and weights in general. There is even a tendency at present to use the double plate wheel instead of the single plate. Steel tired wheels are used on many cars, and pressed steel wheels give great promise of long life, proof against breakage, and low maintenance cost. There seems to be a general cause for complaint in the breakage of axles, and there will doubtless be an increase in size in this direction.

An interesting point was brought out by Mr. Olds regarding the detection of cracks in axles prior to their becoming really dangerous. His scheme is to wipe the axle clean, and then after tapping it with a hammer to make a careful examination for a fine line of grease which will come out of the crack if one exists. The finding of the crack is perhaps made easier by coating the entire axle with white lead after cleaning it.

Remarks were also made as to the general tendency of increasing the strength of car bodies, and several examples were given as to the remarkable performances of these bodies in cases of collision.

AFTERNOON SESSION.

At the afternoon session the report of the nominating committee was given. The following officers were elected: President, Clement C. Smith, Milwaukee, Wis.; first vice-president, Geo. B. Wheeler, Eau Claire, Wis.; second vice-president, Irving P. Lord, Waupaca, Wis.; third vice-president, W. H. Winslow, Superior, Wis.; secretary and treasurer, J. S. Allen, Lake Geneva, Wis.

Following the nomination of officers the association went into a closed meeting for the purpose of discussing the subject of profit sharing by public service companies.

On the opening of the meeting to the public the subject of indeterminate permits in the place of franchises was quite fully discussed and there seems to be a general difference of opinion as to the relative value of the two kinds of franchises. Several were of the opinion that, while a company whose franchise was about to expire should gladly accept an indeterminate permit, a concern which was in good condition would be very foolish to apply for such a permit. George B. Wheeler, of Eau Claire, had previously, he said, asked the opinion of his attorneys regarding this matter. These attorneys, who were financially interested in the plant were greatly in favor of securing an indeterminate permit. It is significant that the public there is very friendly to the lighting and railway company.

Mr. Boler, attorney of the Sheboygan Light, Power and Railway Company, brought out the point that after all there was not such a great difference as to how the company was allowed to run. It is not in the power of law to confiscate property and the expiration of an indeterminate permit can not give the attorney this power. For all ordinary purposes there would seem to be no harm in accepting an indeterminate permit in the place of the ordinary existing franchise.

The law says that when, at the expiration of an indeterminate permit, the city takes over a public service

company, this company must be compensated for its "used and useful" property. This would seem to cover expenses for development which had been incurred.

The meeting was then closed.

ENTERTAINMENTS.

On Wednesday evening a smoker given by the exhibitors to the central station managers was held at the Elks' club rooms on Jefferson Street. Entertainment in the form of songs and vaudeville acts was furnished and several short speeches and many stories made the central station managers temporarily forget their trouble with the Railroad Commission. With plenty to eat, drink and smoke the evening was passed very pleasantly.

The annual banquet was held on the following evening in the fern room of the Hotel Pfister, and after an excellent supper, speeches were made by several men prominent in electrical circles and in public life.

Harold Almert, of H. M. Byllesby & Company, in speaking of the financial difficulties with which many generating plants were meeting, said that the trouble was largely due to too great optimism at first. Too often a company of bankers or other moneyed men who know nothing of electricity, invest funds in an electric plant, organize a company and hire an engineer to run it. The first few years' profits are spent in extension of the plant and as a result, bonds have to be issued. Finally the company can go no further and has to call in an expert for investigation or perhaps the concern goes into the hands of a receiver.

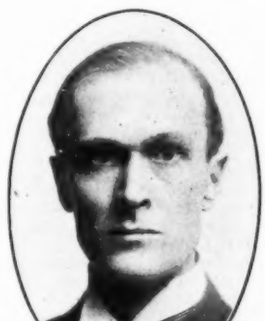
Too much care can not be taken as to the disposition of the funds for the first few years of operation. At some later time it may be necessary to draw on a contingent fund, which should always be maintained.

George B. Wheeler, first vice-president for 1910 and 1911, spoke briefly of the benefits which were resulting from the amalgamation of the two associations to form the new body.

T. Commerford Martin reviewed the work of development of the central station and spoke very encouragingly on the outlook for the coming year.

The difficulties with which the central station managers have to meet was a subject treated by John I. Beggs of the Milwaukee Electric Railway and Light Company. Mr. Beggs particularly extended his sympathy to the managers of small stations, who had not only to act as managers, but as political and legal representative and often had to even collect bills or personally look after the operation of the machinery.

The talk of the evening was given by Professor Shailer Matthews on "The Re-Making of Public Opinion." He spoke especially of the necessity of paying particular attention to the news which was published regarding any power company. Public opinion is formed largely by what appears for the public to read, and this opinion is too valuable to be treated carelessly.



CLEMENT C. SMITH

Clement C. Smith, president-elect of the Wisconsin Electrical Association, is forty-three years of age and has been closely connected with the management of electric railways for the past twenty years. In 1890 he became assistant engineer and later was associate chief engineer of the Minneapolis Street Railway Company. Since 1891 Mr. Smith's headquarters have been in Milwaukee and his business has been transacted from that city. At the present time Mr. Smith is connected with the following companies: president, Eastern Wisconsin Railway and Light Company, Fond du Lac, Wis.; president, Wisconsin Electric Railway Company, Oshkosh, Wis.; president, Citizens Gas Company, Kankakee, Ill.; vice-president, Sterling, Dixon & Eastern Electric Railway Company owning lines in Sterling and Dixon, Ill.; vice-president, Lee County Lighting Company, Dixon, Ill.; president, Columbia Construction Company, Milwaukee, Wis. Mr. Smith is also first vice-president of the Fidelity Trust Company of Milwaukee. He was a charter member of the Wisconsin Electric and Interurban Railway Association and filled the office of secretary and treasurer for two years, later being elected president. Upon the consolidation of that body with the Northwestern Electrical Association in 1909 he became vice-president of the united association.

EXHIBITS.

The exhibits were very simple owing to the fact that the electrical show was in progress in Chicago. It was expected that many present at the convention would later go to Chicago and would see the exhibits there. Several manufacturing companies, however, established headquarters in the various parlors of the hotel and in most of these rooms apparatus was exhibited.

The General Electric Company of Schenectady, N. Y., was represented by M. L. Demming, C. A. Ives, J. D. A. Cross, F. T. Benson, George Osborne, Mr. Parsons and T. W. Jackson, all of the Chicago office.

The Westinghouse Electric and Manufacturing Company was represented by W. R. Pinckard, D. E. Webster, H. R. Snyder, Vincent Gray and J. W. Robinson.

The Allis-Chalmers Company, Milwaukee, Wis., was represented by F. G. Bolles, H. A. Balding and C. E. Searle, sales engineers.

The Duncan Electric Manufacturing Company of Lafayette, Ind., exhibited a number of high torque direct-current watt-hour meters and distributed a number of interesting booklets. Adrian Tobias and Charles E. Hansell represented the company.

Julius Andrae & Sons Company of Milwaukee had a very interesting exhibit containing G. I. flame arc lamps, Nernst lamps, Bryan-Marsh Mazda lamps and a line of Holophane shades and reflectors. An Elmo electrically driven washing machine was also shown. The exhibit was in charge of J. C. Schmidtbauer and A. E. Stadtmuller. P. Ellis of the Holophane Company and Sam Furst of the Bryan-Marsh Company were also present.

The Cutler-Hammer Company, Milwaukee, exhibited a few specialties. H. P. James, sales manager, represented the company.

The Federal Electric Company, Chicago exhibited electric vacuum cleaners and signs. Frank E. Maier was in charge.

Raymond A. Dull was in charge of the Reynolds-Dull Flasher Company's exhibit.

Chas. Polachek & Brothers Company, Milwaukee, Wis., showed a number of very beautiful chandeliers for both house and outside lighting. Edw. G. Hann, Jr., was in charge of the exhibit.

The Mechanical Appliance Company had on exhibition a motor with a magnetic clutch, designed for use in a fish-net loom. Several of the company's standard type motors were also shown. R. G. Kellog, T. H. Ford and I. R. Douglas were the company's representatives.

The Century Electric Company, whose exhibition of single-phase motors was in charge of J. L. Woodress, distributed a number of interesting booklets.

The Pacific Electric Heating Company, Ontario, Cal., showed its line

of Hot Point flat irons, among which was one of the automatic flat irons; the only one approved by the Board of Underwriters. A three pound iron which could be carried in a lady's hand bag was of considerable interest. Henry F. Holland represented the company.

The Central Electric Company, Chicago, showed a Price & McKinloch meter testing outfit for installation in residences or business houses. Remote control devices, tungstometers and high tension insulators were also exhibited. A. W. Dunham, Wisconsin representative, was present on behalf of the company.

Manufacturers' representatives who were not listed among the exhibitors were as follows:

E. F. Borger, representative Midvale Steel Company, Chicago.

J. R. Wiley, Western manager, Standard Underground Cable Company, Chicago.

C. E. Schauffler, sales agent, Galena Signal Oil Company, Chicago.

N. C. Naylor, sales agent, Railway Steel Spring Company, Chicago.

J. B. McMullin, salesman, Electric Appliance Company, Chicago.

Clarence E. Delafield, Crocker, Wheeler Company, Ampere, N. J.

Robt. J. Deneen, district sales agent, Ohio Brass Company, Chicago office.

A. V. Ward, sales agent, National Carbon Company, Cleveland, O.

Wallace O'Connor, salesman, National Carbon Company, Cleveland, O.

C. C. Ewing, salesman, Electric Service Supplies Company, Chicago.

The active member companies of the association were represented at the convention by the following:

H. O. D. Nutting, manager, Water and Light Commission, Fort Atkinson, Wis.

The Beaver Dam Light and Power Company, Beaver Dam, Wis.

F. A. Becker, secretary and treasurer, Antigo Electric Company, Antigo, Wis.

Jas. Mainland, superintendent, Stevens Point Lighting Company, Stevens Point, Wis.

W. H. Truell, receiver, Delavan Light and Power Company, Delavan, Wis.

F. Windsor, Walworth, Wis.

T. A. Pamperin, president, Peoples' Land and Manufacturing Co., Oconto, Wis.

F. A. Vaughn, electrical engineer, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Harold Almert, manager, Apple River Power Company, Apple River, Wis.

Edw. G. Ricker, manager, Bond Department, Fidelity Trust Company, Milwaukee, Wis.

M. C. Beebe, Professor Electrical Enginering, University of Wisconsin, Madison, Wis.

A. F. Paustian, manager, F. Paustian Milling Company, Brillion, Wis.

B. F. Lyons, manager, Beloit Water, Gas and Electric Company, Beloit, Wis.

H. C. Sterling, superintendent, City of New London, New London, Wis.

W. R. Putnam, superintendent, Menominee-Marinette Lighting and Traction Company, Marinette, Wis.

B. D. Viles, manager, Chippewa Falls Lighting Company, Chippewa Falls, Wis.

D. G. MacMillan, president, La Crosse Gas and Electric Co., La Crosse, Wis.

R. B. Carter, manager, City Water and Light Company, Jefferson, Wis.

Theo. A. Waech, president and manager, North Milwaukee Light and Power Company, North Milwaukee, Wis.

E. S. King, secretary and manager, Merrill Railway and Light Company, Merrill, Wis.

John Roemer, superintendent, Municipal Plant, Escanaba, Mich.

F. W. Downs, treasurer, Washburn Electric Light and Power Company, Washburn, Wis.

Chas. Retallic, manager, Light and Power Company, Marquette, Mich.

W. H. Winslow, secretary and general manager, Superior Water, Light and Power Company, Superior, Wis.

A. E. Ellis, superintendent, Light, Heat and Traction Company, Appleton, Wis.

S. G. Moon, vice-president, Northwestern Lumber Company, Eau Claire, Wis.

J. R. Dishington, superintendent, The Milwaukee Electric Railway and Light Company, Racine, Wis.

C. N. Duffy, comptroller, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Irving P. Lord, president and general manager, Waupaca Railway Light and Power Company, Waupaca, Wis.

Ed. B. Meissner, chief clerk to president, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Geo. Kuemmerlein, superintendent transportation, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Fred S. Simmons, superintendent care and maintenance of way, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Ernest Gonzenbach, president and general manager, Sheboygan Light, Power and Railway Company.

H. E. Thomas, secretary, Acker Electrical Company, Sheboygan, Wis.

J. L. Acker, president, Acker Electrical Company, Sheboygan, Wis.

W. G. Mack, superintendent, Columbus Water and Light Plant, Columbus, Wis.

J. L. Ball, Augusta Electric Light Company, Augusta, Wis.

Thos. Whitten, manager, Hayward Electric Light and Power Company, Hayward, Wis.

E. E. McCallum, general manager, Red Cedar Valley Electric Company, Rice Lake, Wis.

A. E. Appleyard, vice-president and general manager, Ashland Light, Power and Railway Company, Ashland, Wis.

E. M. Miles, superintendent, Durand Light and Power Company, Durand, Wis.

H. F. Whitcomb, Jr., vice-president and treasurer, Wisconsin Electric Railway Company, Oshkosh, Wis.

J. P. Pulliam, superintendent, Wisconsin Electric Railway Company, Oshkosh, Wis.

M. E. Ewing, general manager, Grand Rapids Street Railway Company, Grand Rapids, Wis.

M. C. Ewing, treasurer and general manager, Wausau Street Railway Company, Wausau, Wis.

Clement C. Smith, president, Eastern Wisconsin Railway and Light Company, Fond du Lac, Wis.

C. Burkhardt, president and manager, Burkhardt Milling and Electric Company, Burkhardt, Wis.

S. D. Newell, proprietor, Seymour Electric Light Plant, Seymour, Wis.

Louis B. Corl, superintendent, Marshfield Water, Light and Power Company, Marshfield, Wis.

C. M. Jansky, University of Wisconsin, Madison, Wis.

E. P. McCarthy, electrician, Peshtigo Lumber Company, Peshtigo, Wis.

H. P. Broughton, general manager, Southern Wisconsin Power Company, Madison, Wis.

P. H. Korst, secretary and manager, Janesville Electric Company, Janesville, Wis.

B. G. Broed, general manager, Milwaukee Northern Railway Company, Cedarburg, Wis.

D. McNaughton, meter department, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

M. N. Weeks, manager, Electric and Water Company, Grand Rapids, Wis.

Louis B. Corl, superintendent, Marshfield Water, Light and Power Company, Marshfield, Wis.

P. M. Gelatt, secretary, La Crosse Gas and Electric Company, La Crosse, Wis.

J. N. Cadby, inspector of electric service, Railroad Commission of Wisconsin, Madison, Wis.

W. J. Huddle, engineer of electric service, Railroad Commission of Wisconsin, Madison, Wis.

O. S. Derschel, superintendent, Light and Power, Wausau Street Railway Company, Wausau, Wis.

Edw. S. Cary, superintendent, Water and Light Commission, Evansville, Wis.

F. F. Roy, consulting engineer, Madison.

Geo. B. Wheeler, secretary and general manager, Chippewa Valley Railway, Light and Power Company, Eau Claire, Wis.

C. F. Simonson, representative, Moore, Case, Lyman and Hubbard, 159 La Salle Street, Chicago, Ill.

E. W. Hoaglin, Wild Rose, Wis.

F. A. Hecker, secretary and treasurer, Antigo Electric Company, Antigo, Wis.

E. A. Wuester, secretary and treasurer, Falk Company, Milwaukee, Wis.

W. F. Carry, chief engineer, Falk Company, Milwaukee, Wis.

E. W. Alder, superintendent Rolling Stock, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

N. H. Evans, superintendent construction of new shops and buildings, The Milwaukee Electric Railway and Light Company, Milwaukee, Wis.

Oscar A. Aller, representative of the Manitowoc Electric Light Company, Manitowoc, Wis.

D. J. Marcus, manager, Edgerton Electric Light Company, Edgerton, Wis.

O. B. Williams, Whitewater, Wis.

Chas. T. Dahlke, secretary, Neshkoro Light and Power Company, Neshkoro, Wis.

F. R. Hubbard, superintendent, Oconomowoc Lighting Co., Oconomowoc, Wis.

A. R. Owen, vice-president and manager of John S. Owen Lighting Company, Owen, Wis.

W. E. Haseltine, manager, Ripon Light and Water Company, Ripon, Wis.

Prepare for Wireless Tests.

The cruisers *Birmingham* and *Salem* arrived at the Norfolk Navy Yard recently for the lengthening of their wireless telegraph masts preparatory to their further long distance tests at sea, when it is expected to have the ships communicate with the Brant Rock, Mass., wireless station at a distance of 3,000 miles.

They will first go to the South American coast and later to the West African coast, if the wireless apparatus works satisfactorily at 2,000 miles off South America.

The new English Dreadnought battleship Neptune will be fitted with four electric passenger elevators. These were selected after a searching inquiry as to their merits.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring.

CALORIMETRY.

BY CHARLES L. HUBBARD.[1]

A piece of apparatus which should form a part of every well-equipped power plant is a calorimeter for determining the quality of the steam. This is necessary in making evaporation tests of the boilers, and also in indicating the engines for cylinder condensation. While the barrel calorimeter answers the purpose well enough for rough work, one of the forms described below is more accurate and also more convenient to use. The separator calorimeter may be purchased complete if desired, but it is so simple in construction that any engineer who is familiar with the use of tools can readily make one out of standard fittings purchased at any supply house.

A separator calorimeter made up in this way is shown in Fig. 1, and is similar to an ordinary steam separator built on a small scale. This consists of a chamber *A* about sixteen inches in length, made up of three-inch pipe and fittings; *B* is an interior pipe, one and one-quarter inches in diameter, capped at the lower end and perforated with a large number of one-eighth-inch holes as shown. The steam to be tested is admitted through the pipe *C*, and leaves through *D*, across which extends a brass diaphragm having at the center a one-sixteenth-inch hole as indicated by the arrow. The water level in the chamber *A* is indicated by a gauge glass as shown at the left.

The action of the calorimeter is as follows: Steam enters at *C*, where its velocity is checked by an abrupt change in its direction of flow and the moisture in suspension falls to the bottom of the chamber *A*. The dry steam escapes through the orifice in the diaphragm into *D* from which it is led by means of a rubber tube into a tank of cold water where it is condensed and weighed. A small steam gauge at the top is to be used only in special cases to be mentioned later.

When starting a test, steam should be allowed to flow through the calorimeter until it has become thoroughly warmed up, and uniform working conditions have been attained. A thread should be tied around the gauge glass and when the water reaches this point the petcock should be set so as to maintain the water level at this point during the test.

The water flowing from the petcock represents the entrained moisture in the steam and should be caught in a glass flask or large bottle for careful

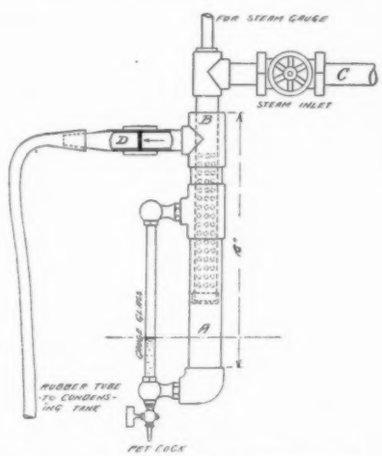


FIG. 1.—SEPARATOR CALORIMETER.

weighing afterward. The rubber hose connecting with *D* should lead into a tank or cask of cold water containing about 100 pounds for a half hour's run, or double that quantity for an hour's run. A clean watertight ash can does very nicely for this purpose. Before the test is begun the cold water and its containing receptacle should be weighed. While the "warming-up" process, as described above, is taking place, the steam from the rubber hose may be blown into the air. When the water line in the gauge glass has been established and the petcock properly adjusted, the rubber tube should be quickly dropped into the cold condensing water, and the glass flask, previously weighed, placed under the petcock. Nothing more is required during the run except to see that the petcock is adjusted to keep the water line in the gauge glass practically constant, and near the end of the test, which may be from one-half to one hour in length, to bring it accurately to the thread marking the starting point.

At the end of the test, the valve in *C*, and the petcock, are closed, the rubber tube slipped off the nozzle *D* and removed from the condensing water, care being taken to let it drain thoroughly. The condensing water and tank are then weighed and the increase in weight recorded. The flask is also weighed and the weight of water collected during the test recorded.

Let W = increased weight of condensing water, = weight of dry steam; w = weight of water caught in flask, = weight of entrained water; Q = quality of steam.

Then $$Q = W/(W + w) \quad \ldots\ldots\ldots (1)$$

This is the working formula for the separator calorimeter.

When a single calorimeter is used in this way it should be carefully insulated by wrapping in hair felt to prevent the loss of heat by radiation.

For the most accurate results two calorimeters may be used, the inlet to the second being attached to the exhaust of the first. In this case perfectly dry steam will be received by the second calorimeter, and any moisture deposited in its chamber *A* will be due to condensation from radiation loss within the calorimeter. Since the chambers of the two instruments are made the same size, this quantity may be used as representing the amount deposited in the first chamber by radiation. In cases of this kind no insulation is required on the calorimeter and the working equation becomes

$$Q = (W + R)/(W + w) \quad \ldots\ldots\ldots (2)$$

where R = weight of steam condensed by radiation, as shown by the second calorimeter.

Example.—A test shows the increase in weight of condensing water to be 17.5

[1] Consulting Engineer, 283 Central Street, Auburndale, Mass.

pounds; the water drawn from the first calorimeter 1.1 pounds, and that from the second calorimeter 0.2 of a pound. What is the quality of the steam?

In this case $W = 17.5$; $w = 1.1$; $R = 0.2$.

Substituting in equation (2) gives $Q = (17.5 + 0.2)/(17.5 + 1.1) = 0.95$.

In case it is not convenient to condense and weigh the steam, a pressure gauge may be attached to the top of the calorimeter as indicated in Fig. 1, and the flow of steam computed by Napier's formula.

This is $W' = PA/70$ ..... (3)

in which W' = weight of steam discharged in pounds per second; P = absolute pressure in calorimeter = gauge pressure + 14.7; A = area of orifice through diaphragm in square inches.

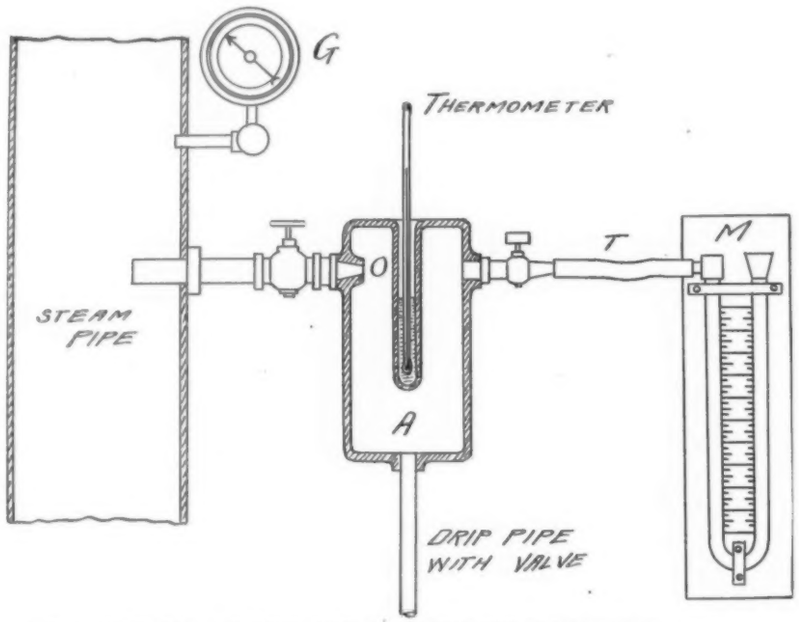


FIG. 2.—GENERAL CONSTRUCTION OF THROTTLING CALORIMETER.

Fig. 2 shows the general construction of the throttling calorimeter. If the percentage of entrained moisture is less than three per cent this gives very accurate results and is convenient to use. Steam is taken from the main by means of a one-half-inch pipe projecting to a point about one-fourth of the distance to the center, and is discharged into the chamber A through an orifice O which is about one-sixteenth of an inch in diameter. This orifice throttles the steam and causes it to superheat an amount depending upon the quantity of moisture which it contains. If the moisture present exceeds a given percentage there will be no superheating and hence the results given by the calorimeter will not be reliable. The temperature of the steam in the chamber A is given by a thermometer immersed in an oil bath as shown. A U-tube, or manometer, for indicating the pressure, is connected with the calorimeter by means of a rubber tube T. Sometimes the manometer is replaced by an accurate pressure gauge so graduated as to indicate very small changes in pressure. The chamber A is provided with a valved drip pipe for draining it.

The readings to be taken during a test are: The pressure in the steam pipe as indicated by the gauge G; the temperature and pressure in the chamber A, as indicated by the thermometer and manometer M. These readings should be taken, say once in five minutes during a test of one-half hour, or once in ten minutes for an hour's test, and an average of the whole used for making the final computation. By use of the valves in the supply, and drip or exhaust pipe, the pressure in chamber A may be kept at any point desired.

The principle upon which the throttling calorimeter operates depends upon the admission of high-pressure steam into a chamber filled with steam at a lower pressure. The excess of heat given up by the high-pressure steam is used, first, in evaporating the moisture in the entering steam, and second, if there is any heat remaining, in raising the temperature in chamber A above that due to its pressure; that is, superheating the steam within it.

The working equation of the throttling calorimeter is obtained as follows:

The heat contained in one pound of high-pressure dry steam before reaching the calorimeter is expressed by

$H_1 = QL + h$ ..... (1)

in which H_1 = heat units in one pound of dry steam at steam-pipe pressure; L = latent heat of evaporation, at same pressure; h = heat in liquid, at same pressure; Q = quality of steam.

After entering the chamber A, the heat in the steam is that due to its reduced pressure plus its superheat.

This is expressed in the equation

$H_1 = Hc + 0.48\ (T_1 - Tc)$ ..... (2)

in which Hc = the total heat in a pound of dry steam at calorimeter pressure; T_1 = temperature indicated by calorimeter thermometer; Tc = temperature of ordinary dry steam at calorimeter pressure.

As the first member is the same in both equations (1) and (2) we may place the second members equal to each other, which gives us

$QL + h = Hc + 0.48\ (T_1 - Tc)$

and solving for Q this becomes

$Q = [Hc - h + 0.48\ (T_1 - Tc)] + L$ ... (3)

which is the working formula for this type of calorimeter.

Its application to a practical example is as follows:

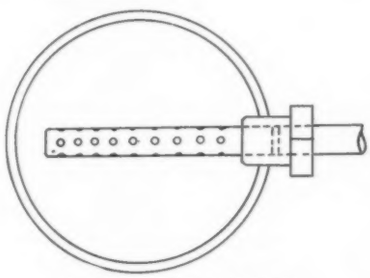


FIG. 3.—SAMPLING PIPE.

Let the pressure in the steam pipe be 80.0 pounds, as indicated by the gauge; manometer pressure 8.0 pounds, which is the pressure in chamber A; atmospheric pressure as deduced from the barometer reading, 14.0 pounds; termperature in calorimeter as indicated by thermometer, 273.7 degrees. What is the quality of the steam?

From the above data and that obtained from a steam table we have:

Absolute pressure of entering steam, $80 + 14 = 90$ pounds. Absolute pressure in calorimeter, $8 + 14 = 22$ pounds. $Hc = 1153$. $h = 294.4$. $T_1 = 273.3$. $Tc = 233$. $L = 886.1$.

Placing these values in equation (3) and solving for Q, we have:

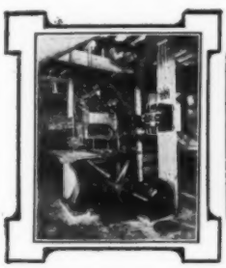
$Q = [1153 - 294.4 + 0.48(273.7 - 233)] + 886.1 = 0.99$.

In order to make a test which shall be of practical value it is very impor-

tant that the sample of steam drawn from the main shall represent the average quality of the whole. Experiments have shown this to vary greatly in different parts of the pipe.

For example: —Samples drawn from near the wall are likely to contain more than an average amount of moisture, while samples taken from the center contain less.

Fig. 3 shows a method for obtaining a fairly representative sample, as a supply is drawn equally from all parts of the pipe. This arrangement consists of a long threaded nipple in which a series of holes have been drilled. This is screwed into the pipe so as to extend nearly across it. If a tap pipe with an open end is used, as in Fig. 1, it should not project into the steam pipe more than about one-fourth the internal diameter. These methods of obtaining a sample of steam apply equally to the barrel and separator calorimeters.



Industrial Power

ELECTRICALLY DRIVEN PUMPS. —IV.

ELECTRIC DRIVE OF TURBINE PUMPS.[1]

It is becoming a well-recognized fact that the electrical engineer, in order successfully to solve the problems of his particular science, must give earnest study and work to many other branches of engineering. The peculiarities of electrical rotating machinery make it desirable, and often essential, to obtain a thorough knowledge of the mode of operation, variation of load, and nature of product, of the mechanical apparatus to which it will be applied. The point of view of the electrical engineer in this study is so different from that of the mechanical engineer in designing his part of the combination that it should cause no surprise if the investigations of the former must run along entirely original lines. Such has most prominently been the case in introducing the electric motor in steel, cotton and paper mills, or when applying gas engines to the driving of electric generators. The turbine, to which this paper will be devoted, has been comparatively neglected, and yet the erratic conditions found in many pump installations show the unquestionable necessity for a better understanding of the problem involved in electric drive of turbine pumps.

The troubles experienced indicate that there are two principal questions, the correct solution of which insure successful electrical operation of turbine pumps: First, the selection of the proper size of motor to take care of varying load conditions; second, the selection of the proper type of motor to meet different starting requirements.

Taking these questions in the order just mentioned, it first becomes necessary to investigate how the load on a turbine pump running at constant speed or nearly so, varies with varying capacity and head. The variation of the load with different speeds is less important and less involved. It is less important, because at each speed that may be desired our reasoning for constant speed is applicable. It is less involved, because the behavior of the turbine pump in this respect is well known, and all necessary information is voluntarily and fairly accurately supplied by the pump manufacturer. The self-evident necessity of allowing margin in the motor for different speeds has caused this condition to be well taken care of. The most frequent speed variation desired is one speed for so-called domestic service pressure and another for fire service pressure. In the case of multipolar alternating-current motors, this variation is generally accomplished by using a different number of poles for the two speeds.

At each constant speed, however, it will be found that most pump manufacturers are by no means certain as to how the load on any particular pump varies with varying head. Neither do they seem to think accurate information in this respect of special value. A glance at the accompanying diagram, which shows a typical relation between head, capacity, efficiency and brake horsepower in ordinary commercial turbine pumps demonstrates the great importance to the electrical engineer of obtaining a similar diagram or equivalent information wherever he undertakes to prescribe the size of the motor. In this diagram an efficiency of sixty-five per cent is assumed, but the relations given will be approximately correct for all efficiencies between fifty nad eighty per cent.

The pump ought to be adapted for an average head corresponding to its maximum efficiency. This head, however, will nearly always vary considerably; the water level will, for instance, rise and fall in the source of supply and in the tank or reservoir into which the water is pumped, or if the water is forced directly into a distribution system, the varying demand will frequently cause the discharge pressure to vary over a wide range. The emptying of dry-docks through turbine pumps presents a particularly interesting problem of this nature. In such cases it will be found that when the head falls off, the capacity generally increases, and as the efficiency at the same time goes down rapidly, the load in most turbine pumps increases. It becomes imperative, therefore, that the electrical engineer should know what this overload amounts to, within the range of abnormally low head liable to occur, and the duration of such overloads.

It is true that the pump manufacturers are beginning to realize that this characteristic of the turbine pump makes it unsuitable for electric motor drive, and that they, therefore, have endeavored, and partially succeeded, in "flattening" the capacity curve over a considerable range, thereby making the horsepower required fairly constant be-

1. Abstract of a paper by J. E. Fries, read before the American Society of Swedish Engineers, at Brooklyn, N. Y., October 16, 1909.—From *Machinery*, December, 1909.

tween the same limits; but the electrical engineer will as yet seldom meet this condition, and in any case it is safe to remember that the size of the motor is governed by capacity at low rather than at high head. Where no information in this respect is obtainable, it is safe to assume the relations shown in the diagram. On account of the efficiency in all motors, and the power factor in induction motors, being lower at lighter loads, electrical engineers should use every opportunity to impress upon pump builders the desirability of designing pumps with a horsepower curve as flat as possible.

Official test records of pumps recently furnished the United States Government for dry-dock purposes will soon be published, and will show that the desired constancy in load has been reached almost to perfection. In these pumps the vanes of the impellers act themselves as automatic throttles, so to speak, restricting the capacity with decreasing head so that the energy consumed is kept constant.

It is often left to the electrical engineer to determine the horsepower required by a certain pump from the capacity in gallons per minute, total head in feet or pounds pressure per square inch, and the efficiency of the pump. Frequently, however, the head given in the specifications does not include friction in the water pipes. It is necessary, of course, to make allowance for this factor when calculating the horsepower of the motor. For the convenience of the electrical engineer who meets this problem, a table was prepared by the author showing the friction head in feet per hundred feet commercial pipe sizes and for different capacities. The number of United States gallons delivered per minute multiplied by 8.3 gives the pounds of water handled per minute. This product multiplied by the sum of the total vertical head and total friction head taken from the table gives foot-pounds work done per minute. If the head is stated as composed of suction lift and pounds of pressure delivered by the pump, it is only necessary to remember that each pound corresponds to 2.3 feet static head. As one horsepower is equivalent to raising 33,000 pounds one foot in one minute against the force of gravity, we obtain the work done in the pump expressed in horsepower by dividing the foot-pounds just calculated by 33,000. This result is often called "water horsepower." A final division by the efficiency of the pump gives effective horsepower required from the motor. The suction lift and the friction head in the suction pipe added together must, of course, be kept as far below the theoretical limit of thirty-two feet as possible.

The second consideration that must be given serious thought when attempting electric drive of turbine pumps is that of starting. The direct-current motors possess such remarkable qualities in this respect that little difficulties are to be anticipated in their application to turbine pumps, provided they have the proper capacity to handle the load under all other conditions. The great majority of electrically-driven centrifugal

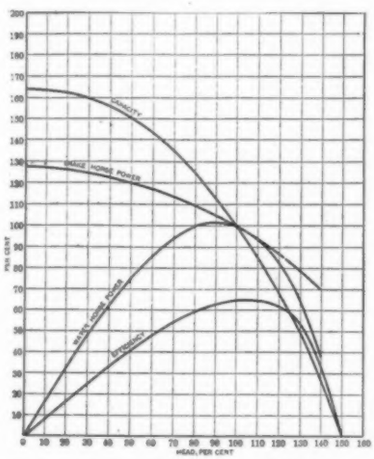


DIAGRAM SHOWING RELATION BETWEEN CAPACITY, BRAKE HORSEPOWER, WATER HORSEPOWER, AND EFFICIENCY OF CENTRIFUGAL PUMPS RUNNING AT CONSTANT SPEED.

pumps are, however, supplied with alternating current. An induction motor of sufficient capacity to handle the expected load will also start the pump successfully, provided the current rush is tolerated. A synchronous motor, on the other hand, may or may not start the pump, the torque of the motor, especially with certain designs, being very small until synchronism is reached, while the torque required by the pump grows with the square of the velocity. Just before synchronism, therefore, is the critical point in starting turbine pumps. The best remedy for this trouble, as well as for excessive starting currents, is to start the pump empty and prime it after full speed has been reached. Where water is not delivered to the pump under pressure, this may be accomplished either by an auxiliary pump of the rotary type, or an ejector where steam is available, in both cases forcing the supply of water up the suction pipe into the pump.

The electrical engineer is often told that although the pump is filled with water, it will start under very light load, because a check valve will be closed either in the suction or in the discharge pipe, and the writer has seen similar statements in specifications issued by consulting engineers of very good standing. The truth is, however, that neither of these expedients improve starting conditions at all. With the valve closed in the suction line, the pump supports the ordinary water column just the same, and with the valve closed in the discharge line, the pump creates a pressure behind the valve, so that in either case the load is practically normal, and the energy consumed is transformed into heat, which soon makes the water boiling hot. The only way to partially relieve the load from a primed pump is to close a valve in the discharge pipe and open an outlet between this valve and the pump, thus discharging close to the pump and letting the water go to waste during the period of starting. In the case of a single-stage pump, however, the capacity is much greater at the lower head, and the load may even be more than normal, as pointed out before, but with multi-stage pumps the water passages through the pump do not allow such great increase of water flow as would correspond to the extremely low head, and although it might be thought that the excess energy would be converted into heat, practice shows that the load on the motor is in this way partly relieved.

It is evident from the foregoing that the synchronous motor of ordinary design when applied to turbine pumps may fail to pull into synchronism. As the starting torque in a synchronous motor is due to eddy currents and hysteresis, and more to the former than to the latter, it follows that every means to increase the eddy currents improves the possibility of starting a turbine pump. Thus solid steel poles are far superior to laminated ones. Some manufacturers provide copper rings around the pole tips for the same purpose. A radical, although expensive, method of improving the laminated pole motor is to provide it with a squirrel-cage winding in the pole faces, thus approximating induction motor starting characteristics. Owing to the big air-gap and consequent leakage and also to the uneven distribution of this secondary winding,

the torque is far from that of an induction motor.

It seems that where synchronous motors are desired the best solution is to prime after starting. It would also seem, however, that where high starting currents are not objectionable, sufficient starting torque may be obtained in synchronous motors with inherent low starting torque, without the highly expensive squirrel-cage winding, by supplying a starting compensator capable of producing about twenty-five per cent excess voltage. As the torque increases with the square of the voltage, this means should in most cases prove sufficient. Precautions must be taken, however, to make the change from one voltage to another gradual and not sudden, so as not to overstrain the windings.

(To be continued.)

Electric Haulage on Canals.

In the fourth and final report of the Royal Commission on Canals and Inland Navigations of the United Kingdom, which was issued recently, some interesting information on electric haulage for inland waterways is given. The following abstracts are taken from a recent issue of *Electrical Engineering:*

The advantages of haulage by electric tractors instead of by steam tugs are as follows:

(1) Assuming that the electric lines are laid on each bank, there will be greater regularity and uniformity of speed in the service than where tugs are used, and there will be less delay in despatching cargoes at short notice and at regular intervals.

(2) The banks and bottom of a canal are not so much injured by electric towing as they are by tug towing. In the latter case the peculiar disturbance to the bottom, with consequential injury to the side banks, caused by the motion of the screw, is added to the wave from the moving boats common to each mode of transport.

(3) In the case of electric towing there is a considerable economy of space and water in locks and lifts, because tugs and steamboats, which by reason of the machinery have a smaller cargo-carrying capacity than barges of like dimensions, need not be taken through.

(4) The electric power, when once installed all along a line of waterway, can be utilized, not only for traction, but also for operating locks and other works, and lighting the waterway at night, and can even, perhaps, be utilized for factories establishing themselves along the waterway.

It has been contended that as the cost of installing electric traction is considerable, its use should be compulsory, and other forms of traction should be excluded. In experiments with electric traction in France where horse traction has been allowed to continue on the same sections, it has been found (1) that it was necessary to undertake extensive works, so as to give room for the rails and still allow room for horse haulage; (2) that a small proportion of slowly-moving boats was sufficient to prevent electric traction from giving all the increased speed of which it is capable. Continental experts are thus being led to these two conclusions: first, that other forms of traction, mechanical or animal, should be excluded; and secondly, that the exclusive right to supply power should be in the hands, either of the owner of the waterway, or in those of the concessionaires. To a certain extent these conditions would assimilate the system of canals to that of railways.

Special attention is drawn to one of the papers read before the Inland Navigation Congress held at St. Petersburg in 1908. This was a report of the proceedings of a subcommittee of the German-Austro-Hungarian Society of Inland Navigation in the preceding year on the "Towing monopoly and mechanical ship-traction on Canals." This committee consisted of representatives of the Governments of Prussia, Saxony, Austria-Hungary, and various expert representatives of inland navigation, and their report is accepted by the Royal Commission as embodying the best informed modern opinion. The committee was unanimously of opinion that "electric towage from the bank is the most suitable means of economical exploitation of the canals." M. Kuhn, City Engineer of Vienna, in a report to this committee, considered that electric haulage could only be advantageous if (a) the whole towing service is handed over to the owners of the electric towing installation; (b) if the goods transported are of such an amount as to make electric towing cost less than towing by tugs.

Electric Pumping in New Zealand.

At the Crown Mines, Karangahake, New Zealand, electric pumps have been installed to raise water against a head of 380 feet, which will later be increased to 750 feet when further sinking is carried out according to present plans. The two Worthington double-acting duplex ram pumps are driven by 250-brake-horsepower induction motors through a double-reduction gearing, the current being provided by a hydroelectric plant over a mile away from the plant. The three-core distributing cables are paper-insulated, lead-covered, served with jute, armored with steel wires, and taped over the armoring. These cables supply the board circuits for the pump motors, as well as the lighting and power circuits for the rest of the mine.

Electricity in Viaduct Construction.

In the construction of the Fades Viaduct, which is situated on the Paris-Orleans Railroad in France, near Clermont-Ferrand, electricity was used to a considerable extent, as in driving the sand mills, mortar mixers, lifting gear, etc. Producer-gas generator outfits were utilized in the power station, and proved very satisfactory in operating. The average fuel consumption worked out to 1.32 pounds of coal per horsepower-hour, a figure much less than that which obtains in cases where portable steam engines are used.

Power Economy in Iron and Steel Works.

In a recent issue of *The Iron Trade Review,* J. A. Knesche contributes a lengthy analytical article on the most economical power for small and medium-sized iron and steel works.

The author, in his conclusion, says: "In the smaller metallurgical works, the low-pressure turbo-electric power plant in connection with some existing steam equipment deserves much more serious consideration than it has received in the past."

Electric Rolling Mills in England.

Electrification of rolling mills in England is making considerable headway. Among new electrically operated mills in that country may be noted the Ormesby rolling mills, which will have completed by next spring two small merchant mills for rolling the smaller sections, and a merchant mill which is being erected by the English McKenna Process Company, at Seacombe, a small town on the Mersey, opposite Liverpool.

A New Source of Rubber.

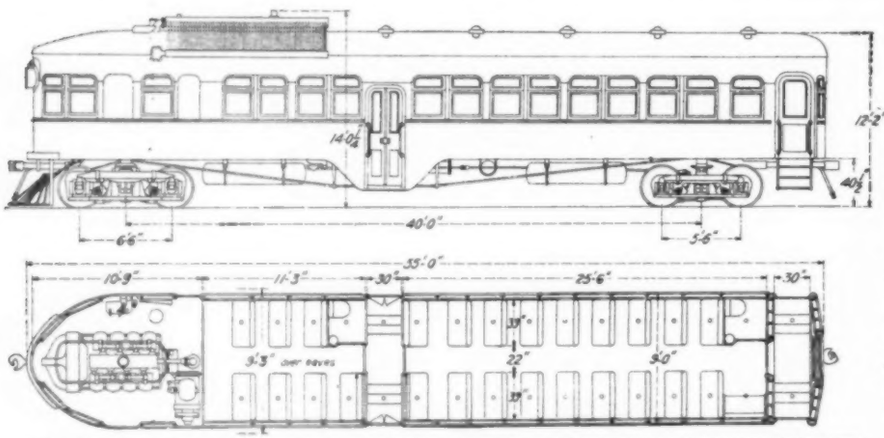
The "cow tree" of British Guiana and adjacent regions, says *The India Rubber World,* while yielding latex freely, has not been regarded as having value as a source of rubber. Recently, however, Mr. G. C. Benson, of that colony, has announced the discovery of a process whereby the product of this tree can be converted into a serviceable quality of balata.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Gas-Electric Cars for Southern Railway Company.

A brief description of the gas-electric motor cars recently purchased by the Southern Railway Company from the General Electric Company, and now under construction, should prove of interest to the many steam railroads which operate similar service. As shown in the outline views these cars have been designed with special reference to traffic conditions in the South. The car is divided by a center entrance. The seating capacity forward of this entrance is fourteen, and to the rear is thirty-eight, making a total seating capacity of fifty-two passengers. A rear entrance is also provided, thus completely dividing the forward and rear passenger compartments.



SIDE VIEW AND PLAN OF GAS-ELECTRIC CAR FOR SOUTHERN RAILWAY COMPANY.

The car body is 55 feet long over bumpers, and of this space the engine compartment will take up 10 feet 9 inches, leaving the balance for passengers and platforms. The car will be constructed of steel frame work and sheathed with steel plates, the interior trim being of mahogany.

The truck under the engine compartment will have a wheel base of 6.5 feet and will be equipped with 33-inch steel wheels. On each axle of this truck will be mounted a standard 100-horsepower, 600-volt box-frame, commutating pole, railway motor, thus giving the car a motor capacity of 200 horsepower. The rear truck will have a wheel base of 5.5 feet.

In the engine compartment there will be a direct driven gas engine generator set, the engine being of the eight-cylinder "V" type, each cylinder 8 inches in diameter by 8-inch stroke. Direct coupled to this engine will be an eight-pole, 600-volt generator provided with commutating poles. This set will be mounted on a cast iron base, and all parts will be above the floor line and readily accessible. Current from the generator will be supplied to the motors through a controller, the function of which is to place the motors progressively in series and parallel, and to vary the resistance in the shunt field of the generator by means of numerous steps, thereby varying the impressed voltage on the motors. The engine ignition is furnished by a low tension magneto and magnetic spark plugs. The carburetor is of the overflow type and hot water jacketed. Compressed air is used for starting the engine, this being supplied to the several cylinders in succession through a distributing valve. Compressed air is supplied from a pump direct driven by the main crank shaft. A small auxiliary gas-engine will drive an auxiliary pump to supply compressed air to the main reservoirs when necessary. This gas-engine is also direct connected to a generator for lighting the car.

Combined straight and automatic air brakes will be furnished, together with the usual auxiliary apparatus, and in addition to these brakes an auxiliary ratchet and hand brake is part of the equipment for emergency use.

A radiator is placed on the roof of the car which provides an efficient means of cooling the engine on the thermo-siphon principle. During the cold weather, hot water from the engine circulating system will be by-passed through the passenger compartments.

Although these cars can be geared for a speed of about sixty miles an hour on tangent level track, such speeds are not usually required on branch line service, and the Southern Railway cars will be geared for a somewhat lower maximum speed.

The ease of control and smoothness of acceleration are prominent features of this type of equipment, and are secured solely by reason of the gas-electric drive principle which it embodies. As there is no mechanical transmission between the engine and the axle, the speed of the engine is not a function of the speed of the car; consequently, the gas-engine may be operated so as to give its maximum output irrespective of the speed of the car, a characteristic which is of great value in case of emergency or heavy work. It has been found that the electrical equipment, consisting of the generator, controller and motors, and which takes the place of the gears, chains, sprockets, clutches and other mechanical means of transmitting the power of the gas-engine to the axle, is subject to very little maintenance expense, and the efficiency of this electric drive is high. The feature, perhaps, which will most strongly appeal to railway men is the simplicity of this control and the ease and certainty with which it can be handled by an ordinary unskilled operator.

To Bond Car Tracks in Lockport, N. Y.

In order to prevent electrolysis of the water supply pipes by escape of current from the electric railway system, a common council committee of Lockport, N. Y., has approved of a resolution calling for the bonding of the tracks of the International Railway between Lockport and North Tonawanda.

CONDITION OF THE GERMAN ELECTRICAL INDUSTRY AT THE END OF THE YEAR 1909.

BY GEORG JACOBY.

The largest electrical firm of the German empire and perhaps of the world has just issued a yearly report which shows not only the situation of that one concern but of the whole electrical industry in Germany. It is surprising how in a year with such reduced prices as in the one just closed it was possible to increase the dividend paid to the shareholders. In the Allgemeine Electricitats Gesellschaft the dividend was this year thirteen million marks, which is only from the manufacturing profits, to which are added other large sums derived from financial operations.

At the beginning of the year the German electrical industry was between fear and hope. There was on one side the threatening taxes for electricity in various forms, on the other the electrification of the main railway mail lines. Now at the close of the year we can see that the former were not so serious as feared and the other feature did not realize the expectations. The tax did not handicap the industry very much, for the greatest competitor, the gas mantles are also taxed now and besides electric illuminants have been so improved that savings can now be made in spite of the tax. But the hopes regarding the railways have brought much disappointment.

In studying last year's report one thought that Germany stood at the beginning of a great development from the standpoint of transportation, the aim of which was the gradual electrification of all steam railways. As financial agent of this movement the Elektrische Treuhand Gesellschaft was founded. In the latest report, however, we read that this concern has deferred the beginning of its activity for an uncertain future day. Thus the past year has not favorably influenced the projects of the trunk lines. The only pleasing event is the granting the concession for operating an electric railway between Cologne and Düsseldorf on the part of the German railway minister.

Another movement is the noticeable building of large overland central-station systems. Already large amounts of electrical energy are being furnished to town and country with such a high degree of economy as cannot be attained by smaller power stations and current is being distributed at prices and conditions which force the local stations to purchase current in bulk in order to make their own business profitable. During 1909 the Markische Electricitats Werk was installed by such central concerns. It furnishes a large number of cities and villages in The Mark, which is the country around Berlin. Its capacity is 10,000 horsepower. The station was to be ready for operation at the beginning of 1910. Three other overland central stations will follow a few months later.

The introduction of electricity for power purposes in various industries has made much progress. The steel mills especially consumed large amounts of current and taking it in such quantities obtained it rather cheaply. In these large works there is an alteration in practice noticeable, as they now give preference to large steam turbines in place of gas engines, while at the same time the various rolls through which the steel ingots pass are driven electrically.

The inland mining industry has not furnished many chances for electrical supplies this year, but from abroad came twenty-three orders for hoisting machinery to the above-mentioned single concern alone. Of other industries the manufacture of paper has been won as a consumer of current. Supplies for street railways have no longer their former importance since the requirements seem to be filled, but the introduction of the steam turbine in this industry is also steadily increasing. The Allgemeine Electricitats Gesellschaft has until recently devoted all its energies to the electrical business only, but has now started the erection of a large shop for making turbines, since during the last months many orders have been received, among which are some of 18,000 horsepower. There will be a further steady increase and this branch will certainly have not been added in vain.

The total net profits were last year 16,384,571 marks, of which the shareholders received, as said before, 13,000,000, the directors, etc., 450,000 marks, the reserve funds, 1,267,255 marks, presents to the officials and the welfare department, 650,000 marks.

A New Insulator for Overhead Lines.

A British inventor, W. Copeland, has designed a new form of insulator for overhead lines, which he has described in a recent issue of our English contemporary *Electrical Engineering*, as follows:

This insulator can be used for all purposes on an installation, either on a straight line, curve, or terminal pole. It can be used for any class of wire—aluminum, bare copper, or insulated—

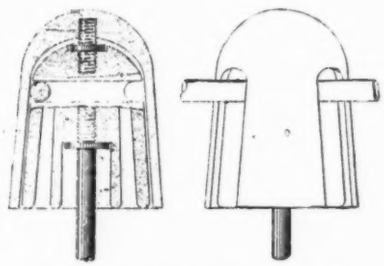


Fig. 1. HIGH-VOLTAGE INSULATOR.

and for telephone, telegraph, electric-light, and power, high or low-tension transmission lines. A special feature about the insulator is that the outside cover can be made of any metal, pot, or porcelain, and when aluminum wires are used the cover of the insulator can be made of aluminum. Binding wires are dispensed with, and the insulator is practically unbreakable.

Sketches of two forms of the insulator are given. That shown in Fig. 1

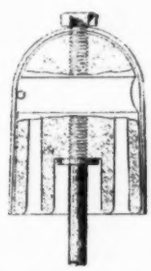


Fig. 2. LOW-VOLTAGE INSULATOR.

is recommended for high-voltage work, and that shown in Fig. 2 for low voltages. The insulator is carried on an ordinary bolt, which has a square collar in order to hold or turn it by means of a key or otherwise. The body is an ordinary porcelain insulator with the usual studs, and has a horizontal groove round it which contains the wire, the latter projecting somewhat from the groove. On the top of the insulator is a screwed socket or stud bolt. This socket is entirely separated

from the socket for holding the bolt by a sufficient thickness of porcelain. The stud bolt has an ordinary right-handed screw on each side of a central collar, and there is a cap, which can be made of porcelain or metal. This cap and insulator are preferably somewhat conical in shape, but the cap is rounded at the top.

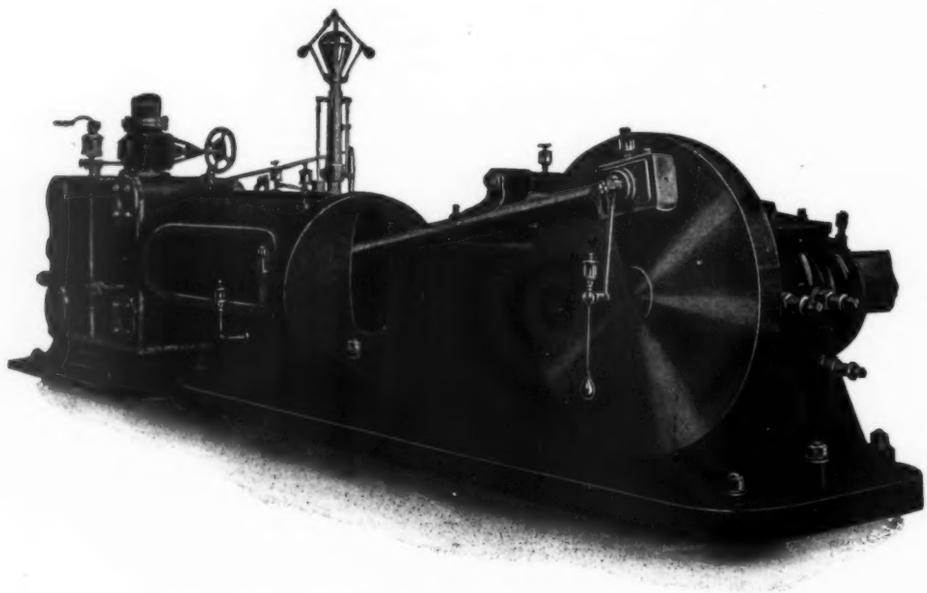
The mode of erection is as follows: The bolt being screwed into the insulator in the usual manner, the stud being also screwed into the insulator, the bolt is put on its supports, but not tightened up. The line wire is placed in the groove, and the cap dropped over, resting on the stud. The cap is now held by the hand and guided centrally, and the bolt turned round until the upper screw of the stud screws tighten in the cap and holds the latter against the wire. The wire is now firmly fixed. This gives no trouble as regards binders when lines are far away, and when unbreakable covers are used it is another very valuable consideration for public roads.

Application for a charter for the Southern Wireless Telephone and Telegraph Company, with a million dollars capital, has been filed in the Superior Court of Atlanta, Ga. It is said to be the plan of the company to establish wireless stations in a number of southern cities with a central station in Atlanta. Southern capital is behind the venture.

The Murray Corliss Engine.

The general principles of the Corliss engine are so well known that it is not necessary to recapitulate them, and the manner in which this type of engine has held its own for more than sixty years is sufficient guarantee of its excellence in theory and practice.

The Corliss engine is commonly regarded as a slow-speed engine, especially suitable for millwork and the like, but the one illustrated herewith is essentially a high-speed engine, using steam of high pressure, and is, in fact, well adapted for direct driving of electric generators. This Corliss engine is one of many types made by the Murray Iron Works, of Burlington, Iowa.



MURRAY "ROLLING-MILL TYPE" HIGH-SPEED CORLISS ENGINE.

A recapitulation of a few of the many special points will be of interest.

The cylinder is one of the best points in the design and compares very favorably with most types of Corliss engines at present on the market. In the Murray engine, the exhaust passages are insulated from the cylinder itself by a dead-air space, thus reducing to a minimum the transmission of heat between the heated cylinder and the comparatively cool exhaust chamber.

The steam valve is of the skeleton type, driven by a T-head valve stem. It is perfectly free to find its own seat, and opens with the current of steam instead of against it. The exhaust valves tend to keep tight by their own weight, this being effected by seating the valves directly below their centers. Other special features in the design of the cylinder and valves reduce clearance losses to an absolute minimum.

The flywheel is made in halves and such care is taken in molding and casting that initial strains are entirely eliminated. It is only necessary to add that the Murray Company has the record of never having had a flywheel burst, to show the reliability of this most essential part of the engine.

Other special features include the high-speed ball-bearing governor with improved safety stops, the valve motion, dashpots supported by cylinder feet, special design of piston, vertically adjustable outer pillow block with oil-retaining rim, new and improved style connecting rod, and last, but not least, the special crosshead with adjustable shoes running in bored guides.

School Tickets a Discrimination.

The interurban lines operating in Indiana will probably be compelled to stop selling what are denominated school tickets. These tickets have been sold to students at a reduced rate, the round-trip fares under special ticket plan being one cent a mile or one-third less than the regular fares. The withdrawal of the tickets will affect a large number of students who attend school daily in the towns and cities while living in the country and villages. The railroad commissioners say that the sale of school tickets is a discrimination and therefore unlawful. S.

An Electrical Cow-Milking Machine.

The central-station man who would increase his day load cannot afford to neglect the slightest opportunity for the sale of his current for power purposes. There is hardly an establishment of any

THE LIBERTY COW-MILKER.

kind that cannot find some use for electric motors.

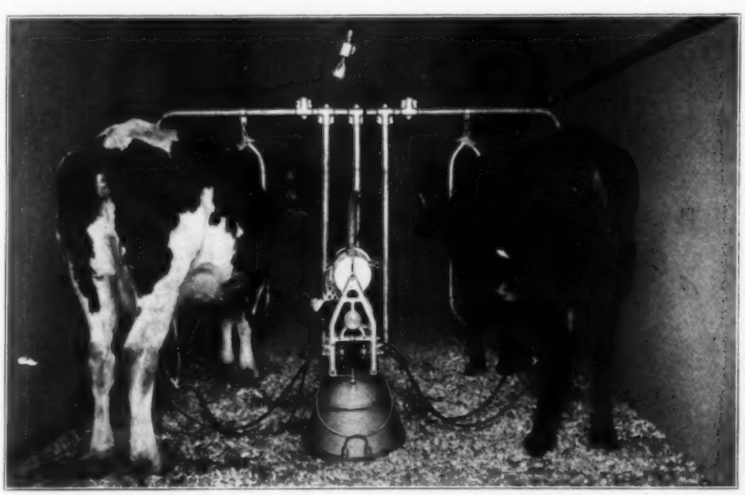
In this present article is described an apparatus of interest to the dairyman, to-wit, an electric cow-milking machine. Many authorities assert that mechanical cow-milkers will eventually displace hand milking, and here is an opportunity for the central station to obtain a foothold in the dairy industry, or to increase his business therein, for many dairies are already using electricity for lighting, and for driving their machinery.

The portable cow-milker outfit described and illustrated herewith is manufacturd by the Liberty Cow-Milker Company, of Hammond, Ind. The sucking action of the machine is intermittent, similar to that of a calf in being suckled by its mother. By means of a motor-driven vacuum pump, and a pair of double valves, a suction is applied at short recurring intervals to the teats of the animal, thus causing the milk to flow as in nature.

The degree of vacuum in the milk can may be observed on the attached vacuum gauge, the vacuum being adjustable by means of a needle valve.

The machine itself is twenty-four inches high and seven and three-fourths inches wide. The pail is twelve inches high with a base seventeen and one-half inches in diameter and an opening seven and one-half inches in diameter. The total height over all is thirty-six inches. The weight of the machine is about thirty-five pounds, including the one-sixteenth-horsepower electric motor. The weight of the pail is about fifteen pounds. The total weight is about fifty pounds.

The smaller of the two views of the milker clearly shows many of the details, and the solid construction of the machine. The other view shows the machine in operation, milking two cows simultaneously. The photograph from which this halftone was made, was taken in the company's factory in Hammond, Ind., where every machine is tested before it is put out for sale, in order to insure its absolute reliability.

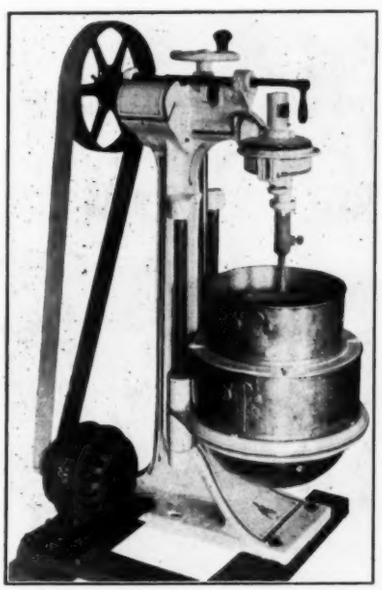


THE LIBERTY COW-MILKER IN OPERATION.

A Motor-Driven Dough Mixer.

Modern electrically driven machinery has lightened the work of the large kitchen and bakery just as it has taken an important place in other lines of production where methods of manufacture are more completely standardized.

The tedious labor of dough mixing, egg beating, etc., is performed economically and quickly by the electric motor, while the work done is considerably more thorough than that accomplished by human agency. The superior sanitary advantages of the electrically driven apparatus are also important considerations in the preparations of a food stuff. Moreover, the mixture is assured to be uniformly and completely worked, without the attention of a skilled operative or baker.



MOTOR-DRIVEN DOUGH MIXER OUTFIT.

A useful form of cake mixer and egg beater is shown in the accompanying illustration. This shows a one-half horsepower Westinghouse alternating-current motor driving a "Baby Grand" dough mixer, built by the Read Machinery Company, of York, Pa. The little motor, which is of the two-phase, sixty cycle, CCL type, runs at 1,740 revolutions per minute, driving the pulley on the mixer at 350 revolutions. Through the arrangement of a nest of gears, three speeds are obtainable at the mixer paddle.

The model shown has its pan equipped with a hot-water bath for making warm batches. In the size of machine shown, two pans are provided,

of five and ten gallons capacity, respectively. Several different paddles are also furnished, each especially suited to some certain consistency of the mixture and the speed at which it is to be worked. The pan is raised and lowered by the handwheel and worm seen paralleling the standard.

Special attention is called to the peculiar motion described by the mixing paddle which, by an arrangement of planetary gears, is kept rotating while it revolves about the center of the pan. The resulting "cutting" and mixing action is most similar to that of hand mixing, and produces a quality of batch which is nearest like that of the hand-mixed dough. The result is obtained, however, much more quickly and thoroughly than is possible in the old hand-kneading processes.

A Municipal Gas-Producer Generator Set.

For supplying the motor-driven pumps of its municipal water-filtration plant, the city of Cohoes, N. Y., has installed two Westinghouse gas-engine-driven, direct-current, generator sets, using producer gas as fuel. Both engines are of the three cylinder type, fifteen by fourteen inches, and develop 125 horsepower. They are direct-connected to two seventy-five-kilowatt, 125-volt, Westinghouse, direct-current generators. The output of these machines furnishes power for the motors driving the pumps of the city water supply, besides several other small motors about the plant, and the local lighting. The producer gas for this installation is derived from two 125-horsepower J-25 Westinghouse gas producers.

The use of the gas producer in connection with the gas engine in a small plant of this kind is found to secure many advantages of economy, efficiency and ease in operation, over the equivalent combination of boilers and steam engines. The large number of such gas-producer plants which have been installed in this country attest the increasing popularity of this modern type of power plant.

New Beardslee Chandeliers.

The esthetic value of decorative art depends upon two things, novelty and association. In this connection attention is called to fixtures illustrated herewith which on account of their novel design are becoming very popular wherever decorative art is required.

The fixture shown in Fig. 1 has a twelve inch square plate at the ceiling with a coppered art glass box thirteen inches long. The four lights on the outside are suspended by silk cord and the

Fig. 1. NEW TYPE OF BEARDSLEE FIXTURE.

Fig. 3. SHEFFIELD DESIGN.

sockets are concealed by small brass covers. The box contains one electric light.

In Fig. 2 is shown a fixture of art nouveau design made of solid cast brass. The sockets and lamps are suspended from the bracket proper by means of silk cord.

The design shown in Fig 3 is one of the new popular Sheffield ribbed designs particularly adapted to residence lighting. It has a spread of ten inches and the length from center to center is thirty-six inches. The shades shown are of alba glass and are designed to conform with the lines in the Sheffield design.

These fixtures, together with many more elaborate designs are being placed on the market by the Beardslee Chandelier Manufacturing Company, Chicago, Ill.

New York, Westchester & Boston.

There has been filed with the secretary of state at Albany, N. Y., a consolidation agreement between the New York, Westchester & Boston Railway and the New York & Portchester Railroad, the name of the former being retained. The capital is $5,000,000. The officers of the company are: L. S. Miller, New York, president; Thomas D. Rhodes, East Orange, vice-president; August S. May, Bridgeport, Conn.,

Fig. 2. ART NOUVEAU DESIGN.

treasurer, and John G. Parker, New Haven, secretary.

The board of directors is made up of Leverett S. Miller, George N. Miller, J. Pierpont Morgan, Lewis Cass Ledyard, William Rockefeller, New York city; Thomas D. Rhoades, East Orange; Chas. F. Broker, Ansonia, Conn.; Charles S. Mellen, James S. Hemingway, A. E. Robertson, New Haven; John H. Whittemore, Naugautuck, Conn.; Edward Millner, Moosup, Conn., and Robert W. Taft, Providence.

A four-track electric railway is now being built by the company from 138th Street, New York, to Portchester.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JANUARY 14.—It is rumored that in consequence of the success of the single phase traction scheme which was recently put into operation in London, by the London, Brighton and South Coast Railway Company, the South Eastern & Chatham Railway Company, a concern handling a very similar suburban traffic to that of the Brighton company, has the adoption of this system for its local lines under consideration.

With this announcement comes the publication of a report by the London traffic branch of the Board of Trade, in which a good deal is said on the question of electrifying the steam railways in London. When the Royal Commission on London Traffic reported a few years ago, one of its recommendations was the appointment of a special traffic authority for London and Greater London. The Government, however, has never seen fit to put any of the recommendations of the commission into operation and consequently the Board of Trade created a special traffic department which fulfills to a large extent the functions of the Traffic Board proposed by the Royal Commission. In the report just issued, Sir Herbert Jekyll, who is the head of the department, gives a general review of the whole question of locomotion in Greater London—which has an area of about 700 square miles. It discusses at some length the electrification of steam railways from the economical point of view. Incidentally, a very definite opinion is expressed that motor omnibuses will eventually supersede electric tramways, especially in the more narrow streets. This is somewhat startling in view of the fact that the purport of the commission's report was that streets should be widened in order to allow of tramways being constructed. No doubt, however, the great expense involved would be somewhat of a deterrent, although an inquiry is now being inaugurated for the survey of all the main arteries in Greater London with a view to arriving at some definite plan for future development of locomotion, both from the viewpoint of street traffic and locomotion in relation to passengers. The opinion of Sir Herbert Jekyll is in favor of the electrification of steam railways, not so much because of reduced working expenses, as of the increased capacity afforded for dealing with greater traffic. As a matter of fact, reduced working expenses have justified the electrification of the Mersey Railway, but I believe that this has not been so pronounced in London. One large railway company in London has carefully considered the matter, and has come to the conclusion that the extra traffic to be looked for would not justify electric traction, and this in spite of the fact that thousands of passengers are being lost annually due to tramway competion. It has been found that tramway competition with railways is effective up to a distance of twelve miles, and it would seem that most of the railway companies have given up all hopes of coping with it.

Owing to the increased use of metal filament lamps and the consequently reduced revenue, the Dublin electric lighting committee has decided to increase its charges by ten per cent. There is at present a bank overdraft on the undertaking amounting to $200,000. This is the first undertaking of any importance in the United Kingdom that has found it necessary to take such drastic action. The Dublin electricity undertaking, however, is somewhat heavily handicapped in the matter of capital charges and therefore has not the same opportunities of resisting the influence of metal filament lamps.

The Royal Commission which was appointed in 1906 to inquire into the canals and waterways in Great Britain has just presented its final report. In this, the use of electric traction upon canals is referred to. The commission recommends the appointment of a canals and waterways authority with powers to acquire certain canals connecting the Thames with the Mersey, and the Severns with the Humber. The feeling of the commission on the question of electric traction, after hearing expert evidence and visiting the continent, is that this is desirable where the traffic is such that the cost of working would be less than with steam tugs. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JANUARY 14.—The new Paris subway line which passes from north to south across town was inaugurated officially this week by running a special train carring various members of the government and municipal officers. This is the first of the subway lines to run underneath the Seine, and the work which took several years to carry out is now entirely finished. The line is at present opened for regular traffic, and it will be largely patronized as it affords a direct route across town which was much needed.

At the watering place of Aix les Bains, France, there has been erected a new electric plant, as the former one proved insufficient. The machines are run in parallel with a storage battery and the current is used for the thermal establishment, the casino and similar buildings as well as for the light and power supply of the town.

There has been opened lately a new power plant in the region of the Rhone valley, Switzerland, and not far from the Simplon. It ranks among the largest in the county to be used for electrochemical processes, and near it is erected the electrolytic works, at Viege. The water of the Viege torrent gives a head of 730 metres, and it is expected to take some 30,000 horsepower from this stream eventually. The enterprise is controlled by the Honza Power Company and the plans of the works were drawn up by M. Boucher, a leading Swiss engineer. Five alternator sets of 8,000 horsepower each are provided for, and part of the outfit is now erected. The alternators are of the three-phase type and work at 15,000 volts, being installed by the Siemens-Schuckert firm. Located at four miles distance is the electrochemical works, to which the wires are brought upon a steel tower line carrying twelve wires.

Professor Rossi, of the Royal Polytechnic Institute of Turin, has devised an original form of detector for aerial waves. It consists of a stretched iron wire which undergoes a torsion from the effects of magneto-striction, this being permanently applied in the first place. The wire carries a mirror at the center, and incoming waves will act so as to modify the original conditions and thus shift a spot of light reflected by the mirror on a screen. The instrument is one of the most sensitive yet devised.

In Austria there is a project under way for an extension of the electric railroad which runs from Trieste to Opcina. From this latter point the line is to be extended as far as Sessana. A new electric traction line has been recently opened in Bohemia. It passes between Zartlesdorf and Hippner Schwebe.

A new Spanish enterprise is the formation of the Cartagena Electric Company with its headquarters at Madrid. It will carry on electrical operations in Cartagena and the surrounding region. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., January 22.—Montreal Street Railway net earnings are improving, and for the past three months the surplus shows an increase over last year of more than sixteen per cent.

The municipal water and light plant of the town of Prescott, Ont., has proven an unqualified success. The report for the past year shows a surplus of $5,000 after providing for all liabilities.

It is reported at Levis, Que., that the municipality may purchase the Dorchester Electric Company, which is capable of developing 1,000 horsepower. The Dorchester company recently obtained the right to enter the town of Lewis, and the idea of purchasing has been developed with a viw to opposing the Canadian Electric Company, which has just passed over to the Quebec Light and Power merger.

A deal has just been consummated whereby a group of Montreal and Toronto capitalists has purchased a large block of the preferred stock of the Monterey Railway, Light and Power Company from G. W. White & Company, and M. W. Halsey, of New York, who originally secured it in payment for the lighting plant. The five per cent mortgage debenture stock is held almost entirely in England, and $500,000 of cumulative preference stock is, by the present deal, now held in Montreal and Toronto.

A report has been made at the offices of the Mexican Northern Power Company, a Canadian concern, which shows the profits that the company expects to receive from the irrigation work it is carrying on. The company has arranged for the purchase of 250.000 acres of irrigable land, and will subdivide these into small holdings. As there is a sum of $10 per acre per annum payment for water supply, the annual payment from this source alone is expected to exceed $2,000,000, a sum equal to the estimated earnings from the sale of power from the company's hydroelectric plant. Such figures are impressive as showing the possibilities of the company.

At a special meeting of the Mexican Power shareholders, held on January 20 at Toronto, the proposed increase in the capital stock by $3,600,000 preferred and $5,400,000 common, making a total capitalization of $25,000,000, was agreed to. It was announced that none of the common stock would be issued at present, but that part of the preferred shares would be disposed of in the near future. It was also announced that the company had completed arrangements for the purchase of the Compania Electrica y Irrigador of Pachucha, and the transmission lines will be concluded to Pachucha. The Irrigador has a hydroelectric station of 12.000 horsepower capacity in operation, is now supplying about 6,000 horsepower, and has contracts for the balance by the end of the

current year. It is figured that this acquisition will be of the greatest benefit to the Mexican Power Company, as the Pachucha district is the largest mine district in Mexico, and a big demand for power is anticipated, resulting in largely increased revenue at slight increase in cost.

The railway committee of the Dominion House of Commons held up for the present the bill respecting the Montreal Central Terminal Company, because the city of Montreal was not represented and because the committee regarded the bill as paving the way for a huge monopoly. The company seeks the power to enter into agreements with the Canadian Northern Railway, the Boston & Maine Railway, the Montreal Terminal Railway, the Intercolonial Railway, and several smaller railways running into Montreal, and to acquire the franchise of the Montreal Light, Heat and Power, the Central Heat and Power, the Saraguay, and the Canadian Light companies. It further seeks authority to enter into agreements with telegraph and telephone companies, and undertakes to expend $500,000 within two years, and to complete its works within seven years.

The Dominion government has referred the proposals of the promoters of the large power development works at the Long Sault Rapids, nar Cornwall, on the St. Lawrence River, to the International Waterways Commission for consideration. The promoters maintained that the project would not interfere with navigation, but, on the other hand, would improve it at that point. According to the company's revised plans, a total development of about 700,000 horsepower is contemplated to be equally distributed between the United States and Canada, although pending a market for half of the total development on the Canadian side, permission is asked to export the surplus to New York state. W.

MEXICAN POWER DEVELOPMENTS.

(Special Correspondence.)

The municipal council of the town of Tonala, state of Chiapas, has granted David E. Thompson, president of the Pan-American Railroad Company the right to generate electric power from the Tonala River, which has its source in the mountains above the town. He was also granted a concession to establish an electric lighting system in the town. Mr. Thompson and associates will erect a hydroelectric plant on the river and build a transmission line to the town.

The Lluvia de Oro Gold Mining Company, Chihuahua, is installing a hydroelectric plant on the river near its mine in the western part of that state. It will have a capacity of 400 horsepower. B. F. Yoakum, of New York, head of the 'Frisco Railroad System, is largely interested in the company.

It is announced that the Compania Hydroelectrica e Irrigador de Chapala, which has its headquarters in Guadalajara, will build an electric railway between Guadalajara and Lake Chapala, a distance of about thirty-five miles, before commencing construction of its proposed Guadalajara-Aguascalientes line. The survey for the proposed road to Lake Chapala has been made and all the plans for its early construction practically completed. E. Pinson is general manager and L. Matty consulting engineer of the company.

The Compania Empresa Irrigadora de la Vega de Metzitlan of Pachucha has obtained a concession from the state government of Hidalgo for the utilization of the water of Metzitlan Lake in Pachucha for generating electric power and for irrigation purposes. The company is composed of men of wealth. It is stated that a hydroelectric plant will be erected and the power transmitted to the mining districts of El Chico and Real del Monte.

The surveys for the great dam that is to be built across the Nazas River have been finished and are in the hands of the government department of Fomento for approval. The estimated cost of the proposed dam is approximately $12,000,000 Mexican currency. It is said that the plans call for the construction of one of the largest dams upon the American continent. The fact that the Nazas River is subject to quick rises and dangerous overflows necessitates provision being made to insure the security of the proposed structure. The expense of its construction will be borne by the government. It is reported that the contractors, S. Pearson & Son, Ltd., of London, England, will erect a great hydroelectric plant at the site of the dam and reservoir and that the power thus generated will be transmitted to the cities of Torreon, Gomez Palacio, Lerdo, Vilardena, Mapimi, Durango and other smaller industrial centers in this part of Mexico. Official publication of the hydroelectric plant concession which is said to have been granted to S. Pearson & Son has not yet been made. D.

LIGHTING AND POWER.

(Special Correspondence.)

AURORA, MINN.—The council is preparing to install a municipal electric light plant. C.

MANITOWOC, WIS.—Dr. J. F. Pritchard and others propose to develop power from the Manitowoc River. C.

BOONE, IOWA.—Plans are being prepared for the rebuilding of the plant of the Boone Electric Company. C.

DUNDEE, MICH.—The Dundee Hydraulic Power Company will issue $10,000 bonds to be used in the construction fo a water power plant. C.

OROVILLE, CAL.—Fred W. Hecker, of this place, has filed on 80,000 miners' inches of water in the Feather River for electric power purposes. A.

PHOENIX, ARIZ.—The City Council has called an election to vote on an issue of bonds to the amount of $300,000 for electric-lighting purposes. A.

SANTA FE, N. M.—The Rio Lucero Power Company has been incorporated with a capital stock of $100,000 by M. Martinez, B. S. Phillips and P. N. Black. A.

WOODLAND, WASH.—The Woodland Water and Power Company has been incorporated with a capital stock of $50,000 by S. A. Burns, E. L. Burns and G. K. Gilluly. A.

LOS ANGELES, CAL.—The Edison Electric Company is planning the erection of a steam power plant with a capacity of 100,000 horsepower on the sea level near Los Angeles.

FORT DODGE, IOWA.—Eastern capital is interested in developing power from the Des Moines River. An engineer has been engaged to make a report on the possibilities. C.

FARIBAULT, MINN.—The Faribault Electric Light Company will extend a line to supply Morristown, Waterville, Elysian, Madison lake and Eagle Lake with power and light. C.

PLACERVILLE, CAL.—T. A. Murray has filed a notice of location and appropriation of 10,000 inches of water in Camp Creek to be used for generating electric power. A.

RIVERSIDE, CAL.—The Board of Supervisors of Riverside county has awarded a gas and electric franchise for the town of Beaumont to the Beaumont Gas and Power Company. A.

ELBERTON, WASH.—The Elberton Milling and Power Company has been incorporated with a capital stock of $60,000 by Charles Hinchliff, Fred Hinchliff and Floyd Hinchliff. A.

LINCOLN, NEB.—Roscoe C. Ozman, city clerk, will receive bids until February 18 for the erection and construction of an addition to the Hutton lighting plant. Estimated cost, $5,330. C.

SALISBURY, N. C.—The Virginia Power Company is chartered at Salisbury with $50,000 capital by John J. Mott, of Statesville, N. C.; N. B. McCanless, of Salisbury, and associates. L.

HAMBURG, N. Y.—The Hamburg Water and Electric Light Company has mortgaged its property to Ella Churchill for $30,000. This mortgage is given to secure the payment of coupon bonds.

ABERDEEN, S. D.—The Aberdeen Street Railway Company seeks a franchise for street lighting as well as car lines. The franchise provides for four miles of railway by the end of this year. C.

HILTON, N. Y.—The new electric lighting plant has recently been put in operation, and the wiring of many residences is now in progress. John E. Cooper of this city has the work in charge.

PHOENIX, ARIZ.—An election will be held February 24th to act on the question of bonding the city for $300,000 for the purpose of acquiring or constructing a municipal electric, gas and power plant. A.

PRESCOTT, ARIZ.—Chief Engineer Masson, of the Arizona Power Company, says that the company is preparing to extend its power line to the camp of the Alvarado Mining Company at Fool's Gulch.

DULUTH, MINN.—The Great Northern Power Company will develop additional power at its plant, to meet the growing demand. The power is capable of an ultimate production of 100,000 horsepower. C.

TACOMA, WASH.—The Commissioners of Public Works of Tacoma is asking for bids for 1,000 horsepower of electric current, on the peak load, for a period of eight months, commencing February 1. A.

GREERS, S. C.—The Greers Manufacturing Company has recently installed a new plant which will be operated entirely by electricity. Contracts have been closed with the Southern Power Company for 500 horsepower.

CENTRALIA, WASH.—The Centralia-Chehalis Water and Power Company has been incorporated here with a capital stock of $250,000 by John E. Heasty, L. W. Goodrich, E. S. Price, F. S. Blatner and Clayton W. Quale.

BRYAN, TEXAS.—J. H. Cleaver, of Houston, and associates have been granted a franchise by the city council for the construction of another water works and electric light plant here. The proposed improvements will cost about $60,000. D.

TACOMA, WASH.—H. J. McGregor, commissioner of public works, will receive bids until February 21, for the construction of the headworks and tunnel for a hydroelectric power plant on the Nisqually River, estimated to cost $657,575. C.

VANCOUVER, B. C.—The C-W-A. Lumber, Shingle, Light and Power Company of Vancouver has been incorporated with a capital stock of $50,000 by J. H. Camerson, D. S. Camerson, E. H. Wright, W. J. Andrews and H. J. Erdman, all of Vancouver. A.

BEDFORD CITY, VA.—Citizens of this city have voted an issue of $100,000 bonds to establish a hydroelectric plant. A number of prominent brokerage firms have been negotiating for the purchase of the entire issue, and the bonds will soon be all taken up.

KEOKUK, IOWA.—It is understood that New York and Boston capitalists have decided to build a power dam across the Mississippi River here, to cost $15,000. It will be 5,800 feet long, 37 feet high, and will generate 200,000 horsepower. The powerhouse will be on the Iowa side. C.

GRAND RAPIDS, MICH.—It is probable that $1,000,000 in bonds will soon be issued to equip the public lighting plant to enter into the commercial lighting field in competition with private lighting firms. This is the result of an amendment to a charter of the municipal lighting plant.

WAYCROSSE, GA.—The Loomis syndicate, which has recently acquired the electric light and power plant, is preparing to make extensive improvements. The buildings and equipment will represent an expenditure of not less than a quarter of a million dollars. Work has already been started.

FARMINGTON, ME.—The Farmington Electric Company has recently sold its property and rights to C. O. Sturtevant, who took possession the first of January. The lines of this company will be connected to those of the Franklin Power Company, which has a plant in Anson on the Carrabasset River.

MINNEAPOLIS, MINN.—The Northwestern Electric Show Association has been incorporated for the purpose of displaying electrical goods and other wares. F. G. Dustin, Theodore L. Hays, G. J. Cadwell, W. D. McDonald, R. W. Clark, W. F. Smith and Joseph Barnard comprise the first board of directors. C.

PRIEST RAPIDS, IDAHO.—The Hanford Irrigation Company will spend $1,000,000 in developing its hydroelectric power plant on the Columbia River. The capacity of the plant will be increased to 25,000 horsepower in order to be able to pump water over the large area covered by the company's canals. A.

SHEBOYGAN, WIS.—A bond issue of $114,000 has been made by the Sheboygan Light, Heat, Power and Railway Company. The bonds are for $1,000 each, with interest at five per cent. The proceeds are to be used for increasing capacity of the power station to 1,500 horsepower and for general improvements.

NORFOLK, VA.—By deed which has been recorded, the Richmond and Petersburg Electric Railway Company has transferred all of its property to the Virginia Railway and Power Company. By the same deed the Virginia Railway and Power Company transfers its property to the Equitable Trust Company of New York.

SEBASTOPOL, CAL.—John E. Bennett, of San Francisco, president of the Russian River Light and Power Company, states that his company has just awarded a contract for the construction of a high-power electric line from Sebastopol to Duncan's Hills by way of the Russian river and from there south to Occidental. A.

BROOKLYN, N. Y.—The New York & North Shore Traction Company has filed plans for the erection of a powerhouse to be located on the east side of Albany Creek near Broadway, Douglaston. The building will cost about $90,000, and will contain a plant to furnish power for the light from Manhasset to Whitestone.

MONTREAL, CANADA.—A contract for increasing the capacity of the generating plant of the Montreal Lighting and Power Company at Lachine has been awarded to Morgan Smith & Company, York, Pa. The improved plant, which is to cost about $175,000, will increase the capacity of the powerhouse by 5,000 horsepower.

ALBANY, N. Y.—The Niagara Falls Power Company has applied to the Public Service Commission for permission to issue refunding and mortgage bonds not to exceed $10,910,000. The proceeds are to be used for the refunding of obligations amounting to $9,078,000. The balance will be used in extensions and improvements of the plant.

LOS ANGELES, CAL.—The Los Angeles Gas and Electric Company has been granted a contract for lighting the streets of the city for the coming year. This contract which involves about $220,000 was let after the board had decided to arrange for the district lighting from year to year with the completion of the aqueduct power plants in mind.

PORTLAND, ORE.—The Portland Railway, Light and Power Company has awarded a contract to the Pacific Coast Engineering Company for putting in the foundation for a large power plant which will be erected at the foot of East Lincoln street. It will be necessary to drive 4,000 piles for the foundation and a bulkhead will be built to protect the piling. A.

OAKLAND, CAL.—The Peoples Electric Light and Power Company has filed a revised application with the Board of Supervisors for a franchise for electric transmission lines through Alameda County and for the conducting of electricity for furnishing heat and power. The changes in the previous application were made necessary by the annexation election by Oakland and of the suburbs. A.

SACRAMENTO, CAL.—E. P. Hilborn, Sacramento manager for the Great Western Power Company, announces the letting of a contract for a substation at Eighth and R streets in this city. This indicates that the Great Western has finally decided to sell current at retail in Sacramento in competition with the Sacramento Gas and Electric Company, the Sacramento branch of the Pacific Gas and Electric Company. A.

NEW RICHMOND, WIS.—The New Richmond Roller Mills Company has awarded contracts for the equipment of a second electric power transmission plant at Huntington, on Apple River. The General Electric Company will furnish the generator; the Jas. Leffel Company, of Springfield, Ohio, will furnish twin water wheels, 800 horsepower, to be delivered by June 1. The power will be transmitted to New Richmond. C.

SAN BENITO, TEXAS.—The San Benito Land and Water Company is having plans drawn and estimates made for a hydroelectric plant which it will erect near San Benito. The initial power will be obtained from the large volume of water that is now wasting over one of its dams in its big irrigatng canal. H. H. Sutton, electrical engineer for the Stone & Webster Company, of Boston, Mass., is in charge of the preliminary work. D.

ST. PAUL, MINN.—The City Councils of St. Paul and Minneapolis have entered into an agreement to become partners in re-erecting the famous "Dam No. 2" to a height sufficient to utilize the power for electrical development. The present navigating lock will be raised at an expense of $250,000. Power provided by this dam will be used in public lighting of both cities and also for the state institutions and military posts.

MIDLAND, MICH.—Plans for developing the water power of Tittabawasset River are now in progress. The undertaking is one of the most extensive in northeastern Michigan, with the exception of the Au Sable enterprise. Seven dams are to be built above Sanford, commencing at Eatonville and continuing into Glenwood County. The present plans do not call for the transmission of power to any great distance, and while it is possible that power will be furnished to Saginaw and other cities franchises have not been asked.

CLEVELAND, OHIO.—Bonds of the Cleveland Illuminating Company of this city are being offered by Spencer Trask & Company of New York. More than three-quarters of the $4,000,000 bond issue has been sold. This issue was made to retire a $1,700,000 mortgage and $1,500,000 general mortgage bond. The Cleveland Electric Illuminating Company has unlimited franchise rights, and its net earnings for 1908 are reported as having been $802,000, or equal to about four times the interest on the present $4,000,000 outstanding bonds.

WAYCROSS, GA.—The property of the Waycross Electric Light and Power Company, which has been involved in a pending deal for some time, has been taken over by the Loomis syndicate, and the owners will rename the property the Waycross Gas and Construction Company. The company will build a new electric plant, which will be driven by new type, directly connected gas engines. A gas plant and wood distilling plant will also be constructed in this connection, the entire outlay being approximately $150,000, making a total expenditure of $200,000, including the recently acquired properties. L.

ALBEMARLE, N. C.—The Town Council of Albemarle has sold $20,000 bonds to an Atlanta firm, the proceeds to be used in constructing a municipal lighting plant and for other purposes. A report says that it appears that the town has not completed a contract under consideration some time ago with the Southern Power Company for electric current for street lights, and that the prospect is that the town will equip its own electric-lighting plant. Local cotton mills, however, expect to have the Southern Power Company current available by February 1. The town plant will be ready for operation about April 1. L.

WILMINGTON, N. C.—The completion of the extensive electrical development at Blewitt's Falls, near Rockingham, N. C., is further established by the filing of a bond of $50,000 with the clerk of the court in Wilmington releasing the attachment secured in the case of W. E. Worth vs. the Knickerbocker Trust Company, of New York, and others. The bond is given with the National Security Company, of New York. This step follows a bondholders' meeting in New York recently at which differences were largely straightened out, so that the Rockingham Power Company can proceed with its undertaking at Blewitt's Falls. L.

RUTLAND, VT.—The Rutland Railway, Light and Power Company has acquired the properties of the Fairhaven Electric Light Company of Fairhaven, Vt., including the Carver's Falls power installation, about four miles from Fairhaven. This includes transmission lines and local lighting business in Fairhaven, Poultney and Hampton, Vt., and Whitehall, N. Y. This purchase will give the company an opportunity to develop to the fullest extent, and without competition, the lighting and power business at Fairhaven. It brings the population served by the company up to over 40,000 people, and by giving it an entrance to Poultney will simplify the construction of a traction line from Castleton to Poultney, a distance of six miles, and the service of power to numerous state quarries in this section.

CHARLOTTE, N. C.—The formal domestication of the Charlotte Power Company, chartered under the laws of New Jersey, has been closely followed by an interesting report here that the Charlotte Electric Street Railway Company will abandon its plans of long standing to build to the Catawba river, and possibly to other nearby points. The officers of the last-named company have not consented to make a statement, but in view of the opening of headquarters in Charlotte by the Charlotte Power Company, which is occupying handsome quarters in the Trust building, and other developments, the report is strengthened that the Charlotte Elec-

tric Railway Company will concentrate its developments to the city and suburbs, where it already has over twenty miles of excellent track in operation. L.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MEDFORD, ORE.—The City Council has granted to John R. Allen a franchise to operate an electric road in that city. A.

LOGAN, UTAH.—The electric street railway of the Logan Rapid Transit Company has just been put in operation. The cars are now running in regular schedule.

LITTLE FALLS, MINN.—It is probable that a trolley line will soon be built between this city and Alexandria, by way of Long Prairie. A number of Long Prairie business men are behind the project.

SEATTLE, WASH.—The City Council has granted to the Seattle Electric Company a franchise to construct a street railway upon certain parts of Atlantic street, Utah street and other streets and avenues in Seattle. A.

OAKLAND, CAL.—Work was begun on the grading of the Oakland and Antioch Electric Railway last week. The first section of the road to be built will be between Oakland and Walnut Creek and Bay Point. A.

LOUISVILLE, KY.—The Louisville Railway Company is preparing to issue mortgage bonds aggregating $20,000,000. The company has $6,000,000 five per cent bonds and $2,000,000 four and one-half per cent bonds outstanding at present.

OAKLAND, CAL.—The Oakland Traction Company will make extensive improvements in its existing lines during the year. The company has put a party of surveyors laying out lines for the broad-gauging of the High street track.

HAMMOND, IND.—The Lake Shore and South Bend Railway Company is seeking a franchise in this city for a loop terminal. Franchise is opposed by property-owners whose land will be affected and impaired for industrial purposes.

SCRANTON, PA.—According to a statement made by General Superintendent T. E. Clark, plans for the electrification of a part of the Lackawanna Railroad are being considered. Electric power will probably be used for suburban service.

OAKLAND, CAL.—The Southern Pacific Railroad Company has applied for a franchise to construct and operate an electric railroad from Albany to Berkeley as a part of its present interurban railroad system between Berkeley and San Francisco.

ASTORIA, ORE.—Active work on the Seaside & Tillamook Railway has been started near this city. The first section of the road to be built will be from the city around Smith's Point to a connection with the county drawbridge across Young's Bay.

NEWTON, KAN.—A charter for an electric railroad, with termini at Wichita and Belleville, has been issued. The road will operate through Newton, Canton, Salina, Minneapolis and Concordia. The capital is $1,000,000. All of the incorporators are Kansas men.

EUGENE, ORE.—The Portland, Eugene and Eastern Railway has in view the construction of an electric railroad from Portland, through Salem and Albany to Eugene and Springfield. The cost of the system from Portland to Eugene when completed will be approximately $10,000,000.

DAVENPORT, IA.—The Rock River Traction Company announces that a contract has been let for the construction of an interurban between Sterling, Ill., and the Tri-Cities, sixty-two miles, for $1,240,000. The Northwestern Construction Company, of Milwaukee, gets the contract.

LYNCHBURG, VA.—Progress is being satisfactorily made in the construction work of the local street railway to Fairview Heights, and an underground crossing at the Southern Railway tracks has just been completed, opening up the way to further work which will be speedily pushed to completion. L.

MEDFORD, ORE.—The Rogue Valley Electric Company, which operates a line between Medford and Jacksonville, will extend its Jacksonville terminus to Applegate Valley. The bond issue of $125,000 has been placed with the Merchants' Loan and Trust Company. A survey for a considerable portion of the road has already been made.

ORANGE, TEXAS.—The Orange Electric Railway Company has been organized for the purpose of building and operating an electric street railway line in the town of Orange. The company has made application to the City Council for a franchise to use the principal streets of the town for its track. The application will be granted, it is said. D.

EUGENE, ORE.—The P. E. and E. Railway Company of Eugene has agreed to build for a bonus of $35,000 several extensions to the city street railway system, including a loop of five miles in length out South Willamette street past College Hill, then into the city again by way of Oregon avenue and to the intersection of Eleventh and Willamette streets. A.

BAKER CITY, ORE.—The franchise for a street railway system in Baker City, granted to Anthony Mohr, A. K. Bentle and T. B. Neuhasen last summer and which expired the first of January, 1910, has been renewed and six months' time given for the franchise owners to begin work. The contract for the ties for forty-five miles of road to be built has been let.

JASPER, IND.—A receiver has been appointed for the Ferdinand Railway Company as a result of action brought by the Ferdinand National Bank. The indebtedness is about $100,000, and the assets consist of seven miles of track, rolling stock and the depot and fixtures at Ferdinand. It is believed that the Southern Railway Company will buy the road in if it sells.

HIGH POINT, N. C.—The North Carolina Public Service Corporation which, in accordance with its franchise, is to have electric cars operating by February 1, 1910, will be ready to start the service shortly, it has been announced by Judge M. L. Hole, of New York, who is interested in the development. The company has completed about one mile of track to date. L.

SCOTTSBURG, IND.—It has been authoritatively stated by J. E. Greeley, president of the Cincinnati, Madison & Western traction line, that actual construction on a new electric line will begin not later than April. The new road will run from Scottsburg to Madison, connecting with the line of the Indianapolis & Louisville Traction Company at this place for Louisville and Indianapolis.

WHITE SALMON, WASH.—The Columbia River and Mount Adams Railroad Company has been incorporated with a capital stock of $20,000,000 by Adolph A. Suksdorf, E. H. Suksdorf and Oswald N. Suksdorf, of Spokane, Wash. The company will build an electric railway from some point on the Columbia River through parts of Klickitat, Yakima and Skamaina counties to Mount Adams.

SAN FRANCISCO, CAL.—The Pennsylvania Railway Company has now secured possession of the west track of the Southern Pacific Company between Mayfield and Los Gatos on the San Francisco Peninsula south of this city, and is bonding the rails, erecting poles and stringing trolley wires over the line. It is given out that the new electric line between San Jose and Palo Alto will be in operation by February 1. A.

BALTIMORE, MD.—Plans are under way for the establishment of an electric line from this city via Belair to Havre de Grace. The project is being promoted by Baltimore county, Harford county and Baltimore capitalists, under the leadership of Alexis Shriver, of Belair. The improvement will probably cost in the neighborhood of $1,500,000, but the territory it will serve promises a goodly return upon the investment.

BROWNSVILLE, TEXAS.—B. G. Stegman, of Brownsville, and associates will apply to the city council for a franchise to build a street railway line upon the principal streets. The proposed system will also extend to the suburb of West Brownsville and across the new international bridge that is being built over the Rio Grande and into Matamoros, Mexico. The cars will be operated either with electricity or gasoline motor. D.

NORFOLK, VA.—Announcement has been made here that certain large interests backed by the Goulds will undertake the construction of an electric railway from Washington, D. C., to Norfolk, by way of Richmond, such a road to all intents paralleling the Richmond, Fredericksbrug & Potomac Railroad. It is understood that the line will be an electric system. The route is approximately 200 miles in length. L.

SODUS, N. Y.—Plans are being made to connect this town to Port Byron by an electric line. The line will first be built from Port Byron to Red Creek. Then the idea is to build from Red Creek to Wallington in this town to connect with the Rochester & Sodus Bay Railway and the Pennsylvania Railway. Between Red Creek and Wallington are Wolcott, North Rose and Alton, all good villages, especially Wolcott for business.

LOS ANGELES, CAL.—The Los Angeles Pacific Railway Company has issued $20,000,000 worth of bonds, of which $14,000,000 is designed to retire the present outstanding bonds of the company and the balance will be devoted to the betterment of its street-railway system. Among the improvements planned are the construction of a subway and additional mileage in the western part of the city and the erection of a central office building.

SANTA ROSA, CAL.—It is reported that arrangements have been made for the sale of the bonds for the construction of the electric railroad from Santa Rosa to Lakeport, known as the Highland Pacific Railroad. The road will run by way of Alexander Valley and Preston to Lakeport, a tunnel being constructed under the divide separating Lake and Sonoma Counties. This will be the first railroad of any kind in Lake County, which is annually visited by thousands of people.

WILLIAMSPORT, PA.—It is rumored that the Williamsport Street Railways Company is about to consolidate with the company that operates the lines around Shamokin. Shamokin is to be connected with Bloomsburg and Danville by consolidation with the Columbia County Electric Light, Power and Railways Company, and this line is to be extended to Wilkes-Barre. Connections are considered at a point near Nuangola with the Wilkes-Barre & Hazleton trolley connections with Lycoming, Montour, Columbia, Northumberland, Schuylkill and Lackawanna counties, if the big loop is built.

SAN FRANCISCO, CAL.—After declaring against municipally owned and operated street railways three times in five years, voters of this city at a special bond election declared decisively in favor of the project. The city owns a cable line extending from Market

Street, out Geary, to Golden Gate Park, the system being leased to private capital. The proposal before the voters was to reconstruct the road and operate it under supervision of city officials. The United Railroads, which practically has a monopoly of street railways in this city, made a vigorous campaign against the $2,020,000 bond issue involved.

VAN BUREN, ARK.—Work on the Fort Smith, Van Buren and Eastern Interurban electric line has been started near this city. The articles of incorporation provide for the construction and operation of an interurban line from Fort Smith through the counties of Crawford, Franklin, Johnson, Madison, Newton, Boone and Searcy, the officers being W. F. Keller, president; L. W. Burgett, vice-president; T. A. Bayley, secretary; S. A. Pernot, treasurer, and S. R. Chew, counsel With the building of this line will come a street car system for Van Buren with a line to Mt. Vista, Van Buren's summer resort, and connecting Van Buren with Fort Smith.

COLUMBIA, S. C.—The Greenville, Spartanburg and Anderson Railway Company has been chartered with an initial capital of $300,000. J. B. and B. N. Duke, the tobacco kings, who are at the head of the enterprise, propose to extend the Anderson interurban trolley from Belton through Williamson, Pelzer and Piedmont on to Greeneville and thence thirty miles to Spartanburg. From Greeneville the line is to be built to Taylor's, Greer, Pelham, Duncan, Reidville, Wellford, Lockhart, Fair Forest and Spartan Mills, a total distance of sixty-five miles. The incorporators are J. B. Duke, B. N. Duke, Ellison Smythe, W. J. Thackston, H. J. Haynsworth and Lewis W. Parker.

SAN FRANCISCO, CAL.—The proposed completion and electrifying of the North Shore Railroad running south of the city, which recently passed into the hands of a receiver, has been temporarily checked in the courts. The road, which has an indebtedness of $1,900,000, lacks one-third, or twenty-six miles, of completion, and is not yet equipped for electrical operation, but it is proposed to issue $3,500,000 in receiver's certificates with which it was claimed that the road could be completed and put in shape to become self-supporting. The matter will probably now be tied up in the courts until the contending parties can agree on engineers to go over the ground and prepare new estimates of the probable cost of completion and equipment. A.

FORT WORTH, TEXAS.—The Board of Trade of Fort Worth has given its endorsement of the proposition of a syndicate composed of Mike Hurley, J. S. Hansford and Paul Hurley to build an interurban electric railway between this city and Mineral Wells. The syndicate requested that citizens of Fort Worth subscribe to $125,000 of the capital stock of the company. A stock subscription campaign has been inaugurated here and the required amount will be raised. The syndicate has made preliminary surveys of the route and is prepared to begin construction work soon after the stock is subscribed. No stock subscriptions will be collected until after the road is finished. The proposed line will be about fifty miles long. D.

BRUNSWICK, GA.—The Terminal and Railway Securities Company now owns the Mutual Light and Water Company and the City and Suburban Railway Company. The details of consolidation were arranged, it is said, in New York, by F. D. M. Strachan, Albert Fendig and others. The Brunswick Terminal and Railway Securities Company is the successor of the Brunswick City Dock and Improvement Company and has a capital stock of $10,000,000. It is reported that this company is not to be simply a holding one but that it will take an active part in the development and upbuilding of Brunswick and the vicinity; that it will co-operate in the construction of the proposed Georgia Coast & Piedmont Railway Company's line from Darien to Brunswick, Ga.

MONTEREY, MEXICO.—The government of the state of Neuvo Leon has approved the plans of the Monterey Railway, Light and Power Company for extending its electric railway system in several directions. When the proposed extensions are finished all of the larger manufacturing and industrial plants in the outskirts of the city will be given transportation facilities. At Guadalajara the Chapala Hydroelectric and Irrigation Company has taken the preliminary steps to build an electric railway between that city and Aguascalientes. The line will be about 120 miles long and will traverse a territory that is now lacking in transportation facilities. This company has a capital stock of $14,000,000, its stockholders being a coterie of the wealthiest men in Mexico. It recently entered the electric-power field of Mexico and is preparing to furnish power for a large scope of territory. D.

COLUMBIA, S. C.—The Greenville, Spartanburg and Anderson Railway, with a minimum capital of $300,000, was commissioned recently by the Secretary of State. The road will run for a distance of sixty-five miles, and will be operated by electricity. Leaving the city of Anderson the line will go direct to Greenville by the way of Williamston, Piedmont, Pelzer and Belton. From Greenville the line will run to Spartanburg by the way of Chick Springs, Taylors, Greer, Pelham, Duncan, Reidville, Wellford Lockhart, Fair Forest and Spartan Mills. The company is backed by Greenville and New York capital. The maximum capital is to be $2,000,000. The petitioners of the company are J. B. Duke, Somerville, N. J.; B. N. Duke, New York city; W. S. Lee, Charlotte, and Ellison A. Smyth, Lewis W. Parker, W. J. Thachston and H. J. Haynsworth, of Greenville. It is stated in the petition for charter that the road will use the lines of the Anderson Traction Company

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

GRANBURY, TEX.—The Acton Telephone Company has been granted a franchise in this city. P.

GRAND VALLEY, COLO.—The Enterprise Telephone Company has been incorporated with a capital of $10,125. P.

LODGE POLE, NEB.—The Lodge Pole Telephone Company has been incorporated with a capital of $10,000.

VAN BUREN, ARK.—Robert Alfred and others are about to construct a telephone line north from this point. P.

MINOCQUA, WIS.—The Northern Telephone Company has been incorporated with a capital stock of $8,000. P.

ROLETTE, N. D.—The Ox Creek Farmers' Telephone Company has been incorporated with H. L. Ambler as secretary. P.

CASTLE ROCK, WASH.—The Pacific Telephone and Telegraph Company has been granted a franchise for its lines in this place. A.

LOUISVILLE, KY.—Arrangements are in progress for the construction of a telephone line from Byrnville to Georgetown. At Georgetown various long-distance connections will be made.

PACHUCA, MEXICO.—The National Telephone Company of Pachuca is preparing to extend its long-distance system to a number of towns in this part of Mexico. It will make important improvements to its existing lines. D.

KENDALLVILLE, IND.—The Home Telephone Company is preparing to make substantial improvements and extensions to its plant. Some additional equipment will be installed and the manner of calling central changed. W. J. Fisher is general manager. S.

HUNTSVILLE, TEXAS.—The Central Texas Telephone Company is installing a large amount of new equipment in Huntsville, Teague, Normangee and Madisonville, where it operates local exchanges. A. B. Foster, of Huntsville, is president and manager. D.

HARTFORD, CONN.—The Connecticut Telephone and Electric Company, of Meriden, manufacturer of telephone switches and electrical supplies, has filed a certificate of its action in increasing its capital stock from $40,000 to $250,000. The company will enlarge its facilities.

LOGANSPORT, IND.—Waller J. Uhl, general manager of the Logansport Telephone Company, denies that any effort is being made by the Bell interests to secure control of the independent telephone companies at Logansport, Peru, Wabash, South Bend, Lafayette and Ft. Wayne, as reported recently. S.

LAREDO, TEXAS.—S. G. Smith has completed the construction of his new long-distance telephone line which runs between Laredo and San Diego, a distance of about ninety miles. The new line connects with the local exchanges and long-distance system of the Southwestern Telegraph and Telephone Company. D.

RAVENA, N. Y.—Articles of incorporation have been filed by the State Telephone Company of Ravena. The capital is $10,000 and the directors are: Harrie McK. Curtis, Leonard A. Warren, Coxsackie; Jasper K. Hotaling, New Baltimore; Ernest L. Haight, Fred C. Bush, George W. Babcock, Lena M. Babcock, of Ravena.

AUGUSTA, ME.—The United Service Company has been organized at Augusta, for the purpose of constructing, owning, operating and maintaining telegraph and telephone lines, etc., with $125,000 capital stock. The officers of the company are: President, R. S. Buzzell, of Augusta; treasurer, E. J. Pike, of Augusta.

BELLEVUE, O.—Injunction proceedings were instituted this week by the village against the Home Telephone Company, restraining it from carrying into effect a threatened increase in rates. The local plant was dismantled and an automatic system installed some time ago, followed by the announcement of higher rates effective on January 1. H.

LITTLE ROCK, ARK.—The Oil Trough Telephone Company of Batesville has been chartered by the state with a capital stock of $1,000. The incorporators are: V. Y. Cook, Paul Butler, V. and O. Cook and May Morrow. The company will operate a telephone line from Newport through all the principal towns of Independence county into Batesville.

TOLEDO, O.—On account of the reported consolidation of Independent and Bell telephone interests of Ohio, a bill will be introduced at the present session of the legislature intended to force interchange of business over competing telephone lines and to regulate toll rates. It is probable that it will be incorporated in the public utilities bill to be introduced by Representative Frank Woods, of Medina county. H.

TRENTON, N. J.—The Delaware and Atlantic Telegraph and Telephone Company recently increased its capital stock from $400,000 to $10,000,000. An amended charter has been filed with the secretary of state. The stockholders assenting to the increase were: U. N. Bethell, president of the company; the Bell Telephone Company of Pennsylvania, James E. Mitchell, W. F. Westbrook, H. S. Hindekoper and F. H. Bethell.

SOUTH BEND, IND.—The Independent telephone interests of

this city and northern Indiana are greatly elated over having obtained an entrance into Chicago. It means independent connection with Chicago for the entire state of Indiana at a lower rate than prevails at present over the Bell lines. The fact is of particular interest to South Bend, since this city is the open doorway or all lines south. Direct wires for toll service between South Bend and Chicago will be connected with the Subway Company early in the spring. It is said that independent telephone securities have increased greatly in value over the country as a result of the deal to get into Chicago. S.

ELECTRICAL SECURITIES.

The attempt to raise prices through the entire stock market last week met with determined opposition. The best friends of the market seemed to have temporarily abandoned it. In spite of all the fluctuations of prices the market became quieter and closed steady at the end of the week. With the high prices of foods, the discussion of wages and the railroad troubles it is not surprising that there is considerable variation in the value of securities.

The $3,700,000 Massachusetts Electric Companies four and one-half per cent notes offered yesterday by a Boston syndicate, have been sold.

The annual meeting of the International Power Company has been postponed to February 18 owing to lack of a quorum.

Theodore P. Shonts, president of the Interborough Rapid Transit Company, in speaking of the figures used recently regarding the earnings of the Interborough company, said: "The figures published relative to Interborough's earnings for the current year seem to have been misunderstood. The actual amounts for the first six months of the fiscal year ending June 30, 1910, which include the leanest months of the year, show an increase in surplus, after dividends, of $1,175,000. This is at the rate of $3,850,000 surplus for the fiscal year 1910."

Metropolitan Elevated's report will show around four per cent earned on the preferred after retiring $100,000 of collateral loans reduced since 1905 from $850,000 to $250,000. January traffic has maintained the gain of the past three months. December traffic exceeded 158,000 passengers daily, the largest in the company's history.

DIVIDENDS.

Columbus Railway Company; quarterly dividend of one and one-quarter per cent on the preferred stock, payable February 1.

Commonwealth Edison Company; quarterly dividend of one and one-half per cent, payable February 1.

Grand Rapids Railway Company; quarterly dividend of one and one-quarter per cent on the preferred stock, payable February 1, to stockholders of record January 15.

Helena Light and Railway Company; regular quarterly dividend of one and one-quarter per cent on the preferred stock, payable February 1 to stockholders of record at the close of business on January 25.

Metropolitan West Side Elevated Railway; quarterly dividend of three-quarters to one per cent on the preferred stock, payable March 1 to stock of record February 15.

NEW YORK.

	Jan. 24.	Jan.17.
Allis-Chalmers common	13¼	14
Allis-Chalmers preferred	47	50
Amalgamated Copper	83⅝	85¼
American Tel. & Cable	*80	*80
American Tel. & Tel.	137¾	138
Brooklyn Rapid Transit	74	75¼
General Electric	155¾	154
Interborough-Metropolitan common	22⅝	24¼
Interborough-Metropolitan preferred	58	62
Kings County Electric	129	129
Mackay Companies (Postal Telegraph and Cables) common	89	89
Mackay Companies (Postal Telegraph and Cables) preferred	77	76½
Manhattan Elevated	137¼	136½
Metropolitan Street Railway	20	20
New York & New Jersey Telephone	123½	123½
U. S. Steel common	86⅝	85½
U. S. Steel preferred	124	123
Western Union	73⅛	74
Westinghouse common	74	73
Westinghouse preferred	130	....

* Last price quoted.

BOSTON.

	Jan. 24.	Jan. 17.
American Tel. & Tel.	137¾	138
Edison Elec. Illuminating	242	242
General Electric	155¾	154
Massachusetts Electric common	18¾	18¼
Massachusetts Electric preferred	81	80
New England Telephone	135	134
Western Tel. & Tel. common	16	16
Western Tel. & Tel. preferred	90	93

PHILADELPHIA.

	Jan. 24.	Jan. 17.
American Railways	48	48¾
Electric Company of America	11⅝	12¼
Electric Storage Battery common	60½	60¾
Electric Storage Battery preferred	60½	60¾
Philadelphia Electric	13⅞	13⅞
Philadelphia Rapid Transit	26	26⅝
Philadelphia Traction	88	88
Union Traction	51	51⅞

CHICAGO.

	Jan. 24.	Jan. 17.
Chicago Railways, Series 1	107	108½
Chicago Railways, Series 2	30	29
Chicago Subway	41½	43¼
Chicago Telephone	129	134½
Commonwealth Edison	117	118
Metropolitan Elevated common	15½	15⅞
Metropolitan Elevated preferred	54	55
National Carbon common	107½	104
National Carbon preferred	118	121

PERSONAL MENTION.

R. A. SWAIN, formerly of Duluth, has been made manager of the Minneapolis office of the General Electric Company, of Schenectady, N. Y.

K. B. ROGERS has been appointed general superintendent of the Winona Railway & Light Company, succeeding C. A. Bernier, who goes to Helena, Mont.

DR. LOUIS DUNCAN and LAMAR LYNDON, consulting electrical engineers, New York city, announce that on January 1st, they severed their association by mutual consent.

LEWIS G. MARTIN, electrical engineer of the Okonite Company, is visiting Chicago, attending the sales conference of the Central Electric Company. Mr. Martin is giving a series of talks to the Okonite salesman throughout the country.

DR. KARL GEORG FRANK, who represents in this country the Siemens & Halske Aktiengesellschaft and the Siemens-Schuckertwerwe, of Berlin, has removed his New York office to Room 2068 Hudson Terminal Building, 50 Church Street.

D. McFARLAN MOORE, of Newark, N. J., addressed the Department of Electricity of the Brooklyn Institute of Arts and Sciences on Tuesday evening, January 25 in the hall of the Polytechnic Institute, 85 Livingston Street. The subject was "Lighting by Luminescence, or Vacuum-tube lighting." The lecture was illustrated by a number of new and unusually interesting lantern slides, together with practical demonstrations of some of the latest forms of the Moore light.

DR. AUSTIN M. PATERSON, formerly associate editor of *Chemical Abstracts*, was, at the Boston meeting of the American Chemical Society, made editor-in-charge of that publication, the offices of which are now located at the Ohio State University. Mr. Patterson, who is an A. M. of Princeton University, and a Ph. D. of Johns Hopkins University, is a young man of many special attainments, and was the editor of the chemistry department of Webster's New International Dictionary, published last fall by the G. & C. Merriam Company, of Springfield, Mass.

IRA W. McCONNELL recently supervising engineer, United States Reclamation Service has accepted the position of chief irrigation engineer with J. G. White & Company, engineers, New York, N. Y. Mr. McConnell is a graduate of Cornell University and has been prominently associated with several important government engineering projects, having for the past few years, general supervision of all government irrigation work in the Western states. Mr. McConnell in his new position will have general supervision of all matters relating to irrigation undertakings.

LERCY M. HARVEY, sales manager of the Milwaukee district office of Allis-Chalmers Company, died at the New Partridge Hotel in Augusta, Ga., on Wednesday, January 19, from diabetes and Bright's disease. Mr. Harvey had been in poor health for the past five months and a short time ago went south with the hope that the change in climate would benefit him. Mr. Harvey was born in Oak Park, Ill., thirty-seven years ago. His early education was obtained in the public schools of that suburb. After completing his preparatory work he entered the University of Michigan, graduating in 1898 from the course in electrical engineering. He was a member of the Psi Upsilon fraternity and was one of the best-liked men in his class. After graduation Mr. Harvey entered the employ of the Westinghouse Electric Company and was with that company for about a year. From there he took up experimental work for the Siemens & Halske Company, in Chicago. Later he was in the Chicago sales office of the Northern Electric Manufacturing Company. Six years ago he accepted a position in the sales department of Allis-Chalmers Company and about three years ago was made manager of the Milwaukee district office, which position he held until his death. In November, 1903, Mr. Harvey was united in marriage to Miss Julia Stuart and for the past several years they have made their home at 625 Frederick Avenue, Milwaukee. Besides his wife, Mr. Harvey is survived by his father and mother.

PROPOSALS.

POST OFFICE, HENDERSON, N. C.—Notice has been given that the time for opening bids for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) at the United States post office, Henderson, North Carolina, has been extended from January 17 to February 18, 1910.

POST OFFICE, HOT SPRINGS, ARK.—The office of the Supervising Architect, Washington, D. C., will receive bids until March 1, 1910 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension to the United States Post Office at Hot Springs, Ark., in accordance with drawings and specification, copies of which may be obtained from the custodian at Hot Springs, Ark., or at the Supervising Architect's office.

BUILDINGS AND MACHINERY FOR FORT BAYARD, N. M.—Sealed proposals, in triplicate, for the complete construction,

plumbing, heating, electric-light wiring and electric-light fixtures for one double set of hospital sergeants' quarters and one power plant with machinery for refrigerating and electric-lighting systems at this post, will be received until February 15, 1910. The United States reserves the right to accept or reject any or all proposals or any part thereof. Envelopes containing proposals should be marked "Proposals for Public Buildings" and addressed to Capt. S. P. Vestal, constructing quartermaster. A deposit of $10 will be required of intending bidders to guarantee the return of plans and specifications.

NEW PUBLICATIONS.

CORNELL UNIVERSITY, THE PRESIDENT'S REPORT.—The seventeenth annual report for 1908-1909 of the president of Cornell University, has recently been issued. Included as appendices are the reports of the treasurer, deans of faculties, directors of colleges, the registrar, librarian, and other officers.

WORCESTER POLYTECHNIC INSTITUTE, CATALOGUE FOR 1909-1910.—This, the fortieth annual catalogue of the Institute, which has recently been issued, contains a complete synopsis of the courses of instruction, a register of graduates, and much other information of interest to alumnae and intending students.

UNITED STATES NAVY DEPARTMENT.—The annual report of the Chief of the Bureau of Construction and Repair, to the Secretary of the United States Navy, and covering the fiscal year 1909, has just been issued. The report, including a copious index, makes a fair-sized volume of 246 pages. Similar reports of the Paymaster-General (377 pages) and of the Chief of the Bureau of Yards and Docks (147 pages), have also been issued.

OCCLUDED GASES IN COAL, by S. W. Parr and Perry Barker, issued as Bulletin 32 of the Engineering Experiment Station of the University of Illinois, is essentially a study of the behavior of coal towards the atmosphere. The avidity of coal for oxygen is made evident, and the results of the entire work bear directly upon the matter of weathering and of spontaneous combustion. Copies of this bulletin may be obtained gratis upon application to Prof. W. F. M. Goss, Director of Engineering Experiment Station, University of Illinois, Urbana, Ill.

THE LIFE HAZARD AND RESUSCITATION IN ELECTRICAL ENGINEERING is the title of a thirty-page booklet written by Clem A. Copeland and recently published by the Technical Publishing Company, of San Francisco, Cal. It is a reprint of a lecture delivered before the Los Angeles Section of the American Institute of Electrical Engineers. After calling attention to the great increase in fatalities from electric shock the author urges the need of general knowledge of how to avoid shocks and how to revive persons that may have been so injured. There is included a list of wiring regulations that should be enforced by all civic bodies interested in lessening this life hazard. The notes on reviving persons injured by electric shock are given in a simple and clear manner and illustrated by a number of views. This booklet is one that should be in hands of electrical workers, firemen and policemen. Its cost is thirty-five cents.

THE PREVENTION OF INDUSTRIAL ACCIDENTS.—This publication (No. 1, General) has just been issued by The Fidelity and Casualty Company of New York. On the title page is the maxim, "An Ounce of Prevention Is Worth a Pound of Cure," and this is the keynote of the whole book, which describes with illustrations and diagrams many ways of preventing accidents in industrial establishments. Much valuable mechanical and electrical information is thus made available which can hardly be found in any other publication, and there is no doubt that many accidents could be prevented if shop and factory managers would avail themselves of the guidances thus set forth. In a circular letter distributed with the book The Fidelity and Casualty Company makes the following remarks: "This pamphlet has been prepared by us for the information of our policy-holders in the various industrial lines. We are sending a copy to each such policy-holder. It is estimated that each year from 30,000 to 35,000 wage-earners in the United States lose their lives by industrial accidents, and that each year 2,000,000 non-fatal accidents occur in the United States in industrial work. Our study of the matter, from the data of our own experience and from tabulations made abroad, leads us to believe that possibly sixty per cent of accidents in industries are preventable. Having ascertained this, we have prepared this pamphlet to indicate to operators of works what preventive means can be utilized." The publication is timely and of the utmost importance, and were its instructions and lessons even approximately followed, the United States would undoubtedly lose much of its present unenviable reputation among the nations of the world for the great number of preventable accidents which are constantly occurring in its great industrial establishments.

INDUSTRIAL ITEMS.

THE AMERICAN ENGINE COMPANY, Bound Brook, N. J., is distributing a booklet entitled, "Arrangement of Engine Cylinders to Produce Uniform Torque."

THE WAGNER ELECTRIC MANUFACTURING COMPANY, of St. Louis, Mo., announces the opening of a district office in Detroit, Mich., in the Union Trust Building, Room 509, with A. B. Hoffman personally in charge.

MACGOVERN, ARCHER & COMPANY, 114 Liberty Street, New York, N. Y., are distributing their latest catalogue which contains a complete list of electrical and steam machinery and apparatus. There is also listed cars, car equipment, etc.

THE WHEELER CONDENSER AND ENGINEERING COMPANY, Carteret, N. J., is distributing a booklet containing a story reprinted from *The Iron Age* entitled, "A Radical Improvement in Jet Condensers."

THE ILLINOIS APPLIANCE COMPANY, 164 Dearborn Street, Chicago, Ill., has recently distributed a folder describing the Adaptable lamp changer. This device will handle any size or shape of lamp at any height or angle. It is made of steel but weighs only eight ounces.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has received an order from the Cambria Steel Company for additional generating equipment for the works here. It will install a 3,750-kilowatt, 2,300-volt, three-phase turbo alternator. The turbine will operate under a steam pressure of 125 pounds and with a twenty-seven-inch vacuum.

THE DUPLEX METALS COMPANY, Singer Building, New York, N. Y., in a folder recently sent out, illustrates the strength of its copper-clad steel wire when covered with sleet and snow. The subject of the folder is "Sleep Easy While It Sleets." Copper-clad steel wire is sold by the Dielectric Company of America, Belleville, N. J.

THE WESTERN ELECTRIC COMPANY, Chicago, Ill., describes in a very neatly arranged folder their 106 type rural line magneto switchboard which is used in connection with rural lines. An illustration of this switchboard and also of the five-bar magneto telephone is given. A diagram shows fully the method of wiring the 106 switchboard and the 1317 type telephone set.

STONE & WEBSTER, of Boston, Mass., have opened offices in the Hanover Bank Building, New York city, to deal in the securities of the electric railway, lighting, power and gas companies under the direct management of their organization. The Stone & Webster Engineering Corporation, which does a general engineering and construction business, will also be represented at these offices.

THE BUCKEYE ELECTRIC COMPANY, Cleveland, Ohio, is distributing another attractive folder dealing with arguments in favor of using Buckeye incandescent lamps. The argument in this folder considers the lamp question from the standpoint of the plant engineer. This company has also recently distributed a handsome calendar for the year 1910 containing a colored reproduction of the painting entitled, "The Leader."

THE ELECTRIC CONTROLLER AND MANUFACTURING COMPANY, Cleveland, Ohio, has recently distributed the January copy of "Common Sense." It contains the usual generous amount of good readable articles intermingled with humor. The feature of this number, however, is the first installation of a series of five articles written by A. C. Eastwood, president of the company, on "Dynamic Braking for Electric Hoists."

THE MASSACHUSETTS CHEMICAL COMPANY, Walpole, Mass., announces that the past year has marked an exceptional increase in the use of Armalac, particularly for the insulation of armatures. This appears to be the logical result of maintaining for nearly twenty years the same quality of product. Because it remains plastic under repeated heating and cooling, Armalac enables the coils to resist moisture even after years of service. Such plasticity results from the fact that this insulating compound is made upon a base of black paraffin wax, the melting point of which is raised permanently by a process known only to this company. This permanency of insulation distinguishes it from cheaper spirit varnishes which by drying out and crumbling lose what moisture proof qualities they may have originally possessed.

THE PETTINGELL-ANDREWS COMPANY, Boston, Mass., is distributing the January issue of *Juice*, its regular monthly publication. "Mazda Lamps" is the title of a very interesting article in this number which explains the meaning and history of the word "Mazda." Other interesting features are descriptions of reflectors, connectors, fuses, fuse boxes and bell ringing transformers. A price sheet is enclosed in each copy which announces important price reductions on "Peerless Mazda" lamps.

THE KIMBLE ELECTRIC COMPANY, Chicago, Ill., has issued a new catalogue devoted to its variable-speed, single-phase motors. These motors are entirely self-contained and require no resistance, starting on compensating coils or controllers. They provide a steadily variable speed and reverse on single-phase circuits and start with full torque without excessive starting current or low power factor. The new catalogue points out these and other advantages of the Kimble motors, besides giving lists of the various sizes.

THE HART MANUFACTURING COMPANY, Hartford, Ct., announces that Granville E. Palmer has severed his connection with the Pettingell-Andrews Company and the Price-McKinlock Company and has entered the employ of the Hart Manufacturing Company. The meter connection block, O. K. fuse block cover, remote

control switch, O. K. ground clamp, and kindred other devices developed by Mr. Palmer and manufactured by the Price-McKinlock Company will now be manufactured and sold by the Hart Manufacturing Company.

THE NATIONAL METAL MOLDING COMPANY, Pittsburg, Pa., is distributing an attractive folder illustrating another advantage of "Sherarduct," the rust-proof, non-corrosive conduit. A photograph is reproduced showing a wireman bending a five-foot length of "Sherarduct" to an angle of ninety degrees by hand. The process this conduit is subjected to during manufacture is fully described and its advantages pointed out. There is also shown a photograph of a piece of conduit which has been bent and pounded but still retains its rust-proof qualities.

THE BRIDGEPORT BRASS COMPANY, manufacturers of Phono-electric wire, announces that on January 22nd, its general sales department was moved from New York city to Bridgeport, Conn., where a new office building has been provided in which are located the general offices of the company. The centralizing of all departments of the company at Bridgeport makes it possible to serve its customers better and more promptly than in the past. A branch office will be retained at the old address in New York, corner Broadway and Murray Street, Postal Telegraph Building.

THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, Chicago, Ill., has recently issued Bulletin No. 53, in which the company's standard apparatus and methods are described and illustrated so that the reader is given a clear idea of the detailed plan of construction. While the Kellogg Company is ready to manufacture switchboards for special conditions and has the experience of every class of this work successfully accomplished, it recommends in this bulletin that standard equipment and circuits be used, as this means reduction of first cost and quicker delivery.

THE SCHAEFFER & BUDENBERG MANUFACTURING COMPANY, New York, N. Y., describes and illustrates instruments of precision for measuring pressure, temperature and speed in a recently issued catalogue. Among the instruments described are vacuum gauges, water pressure gauges, pyrometer gauges, altitude gauges, illuminated dial gauges, hydraulic gauges, etc. Special attention is called to the Schaeffer & Budenberg draught gauge, which instrument is the means of indicating correctly pressures or draughts of one-hundredths of an inch of water column. It is fitted with a large, easily read dial.

THE MOORE ELECTRICAL COMPANY, 169 Malvern Street, Newark, N. J., states that the installation of the white Moore light for color matching in various textile mills near New York city during the past four months has enabled 10,000 employes to work full time, regardless of daylight or weather conditions. Heretofore on dark days they were compelled to remain idle, and it was impossible to operate several departments of the mills at night. The newest product of the Moore Electrical Company is the Moore light window. It is factory-built and semi-portable, and can be installed very readily.

THE H. W. JOHNS-MANVILLE COMPANY, 100 William Street, New York, N. Y., has recently distributed a booklet descriptive of Transite asbestos wood. This material is mineral in character and is made from asbestos fibre and binding cements. Its adaptability to manipulation by means of wood-working tools permits of its use in all cases where wood is employed and several typical installations are described and illustrated in this booklet. Ebony asbestos wood in the electrical field is particularly indicated for the following purposes: Switchboards, panel-boards, switch and fuse bases, duct linings, rheostat tops, etc.

THE CAMPBELL ELECTRIC COMPANY, Lynn, Mass., has recently sent out a catalogue devoted to time switches. Among those described are switches for one or eight days, double or triple pole, ten to 250 amperes at 250 volts, oil break for high tension and multiple circuit. There are several types of eight-day switches listed covering all classes of service. The oil break switch is made to control series street lighting circuits and will break circuits of any potential up to and including 4,500 volts. The type A one-day switch is intended for use where it is convenient to wind and set the clock movement each day. Other types are also described and illustrated.

ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has made a record for quick delivery of power machinery as a result of a recent order placed by the Lincln Traction Company, of Lincoln, Neb. The contract was signed on December 16 and Allis-Chalmers Company was notified, but it did not receive the contract for several days. This contract called for a 500-kilowatt, three-phase, 2300-volt condensing steam turbo-generator. This machine, ready for erection, was shipped from the works in seven days from the date of signing the contract by purchaser. Ability to make such prompt deliveries is much appreciated by concerns which find themselves in urgent need of machinery due to accidents or other causes.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, Pa., is distributing Bulletin No. 118 describing an installation of Chloride accumulators on the system of the Otsego & Herkimer Railroad Company, the batteries being for the regulation of the alternating-current and direct-current system. This road operates heavy interurban cars which means that the load on the generating apparatus varies constantly. The storage battery and its regulating apparatus relieve the generating machinery of the severe fluctuations of load. This installation has shown that the company's carbon regulator with its special solenoid developing for alternating-current regulation is extremely sensitive and is adapted to give the closest degree of regulation that may be desired. The apparatus is particularly rugged and requires no expert attention to keep it in adjustment. Copies of this bulletin describing regulating apparatus for controlling alternating-current circuits will be sent on request.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has just issued a number of valuable publications. The first of these (No. 4707) is entitled "Gasoline-Electric Plants for Lighting and Power," and is a very attractive pamphlet that illustrates and describes in detail complete generating units consisting of a direct-current generator mounted on the shaft of a gas engine. The pamphlet also shows pictorially a number of the many uses to which current from such a set can be put. Bulletin No. 4706 is devoted to type CR curve-drawing ammeters and voltmeters for alternating or direct current. This type of instrument gives a clear, permanent record of the characteristics of the electric circuit to which it is applied, and is of value in locating trouble with electrical apparatus, in proving the efficiency of machines and workmen and in determining the correct size and style of the new machine. Bulletin No. 4703A describes the variable release air brake equipment, which eliminates the defects usually found in the standard automatic air-brake equipment for electric service. With the former equipment it is possible to handle a long train with nearly the same facility as single cars can be handled with the straight air-brake system. Bulletin No. 4711 treats of alternating-current switchboard panels designed for small plant service, no provision being made for operating generators in parallel, although the instrument equipment is suitable for balanced or unbalanced loads. The bulletin lists panels for two-phase and three-phase circuits, shows the connection diagrams for such panels and gives dimensions and capacities. Bulletin No. 4712 is a reprint of an excellent article describing an exhaust steam turbine installation in Philadelphia. It shows that with no additional steam the net output of a non-condensing engine plant may be increased seventy-five per cent by exhausting steam turbines. The bulletin also contains a reprint of an article entitled "Increasing the Output of Steam Plants," and some miscellaneous notes on the low-pressure turbine. Bulletin No. 4713 describes type F, forms K-2 and K-4 oil switches, states their rupturing capacities, contains diagrams of connections of these switches, which within recent years have been adopted for the control of practically all alternating-current circuits of 440 volts or over.

DATES AHEAD.

Philadelphia Electrical Exposition, Philadelphia, Pa., February 14-26, 1910.

Minnesota Electrical Association annual convention, Minneapolis, Minn., March 29, 30 and 31.

Missouri Electric, Gas, Street Railway and Water Works Association, next convention at Jefferson City, Mo., on April 14, 15 and 16.

Florida Electric Light and Power Association, next meeting at Tampa, Fla., April 21, 1910.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) January 18, 1910.

946,531. COIL FORMER. Jacob Beech, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed April 5, 1907. Between heavy end blocks, one of which has a laterally projecting coil form, is a narrow member having a laterally projecting coil form.

946,537. ELECTRIC LINE CONSTRUCTION. Harry P. Davis and Theodore Varney, Pittsburg, Pa., assignors to Westinghouse Electric & Manufacturing Company. Filed June 4, 1906. An electric line hanger for catenary construction.

946,540. STORAGE BATTERY. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J. Filed March 23, 1908. A mass of

active material for alkaline storage batteries is soaked in a solution of a bismuth salt, and the mass heated in a caustic alkali solution.

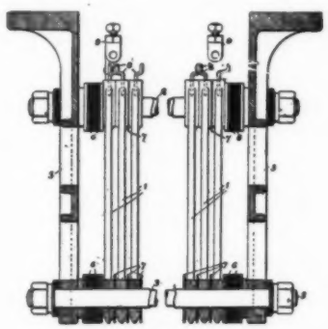
946,542. LIGHTNING ARRESTER. William R. Garton, Brooklyn, N. Y., assignor to C. J. Griffin, Montezuma, Iowa. Filed November 2, 1908. A solid homogeneous member interposed in an electric circuit is adapted to absorb moisture from its surrounding medium.

946,544. RHEOSTAT. Ford W. Harris, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed January 16, 1906. A strip of resistance material is disposed on spools in zigzag formation.

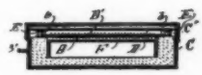
946,546. SECTION INSULATOR FOR ELECTRIC LINES. Hall F. Hoxie, Brooklyn, N. Y., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa. Filed December 6, 1907. A pair of strain rods connect corresponding ends of a pair of vertical insulators from which bracket arms project downwardly and are attached to the ends of an interrupted line conductor.

946,549. OVERHEAD TROLLEY SYSTEM. Kalman von Kando, Vado Ligure, Italy, assignor to George Westinghouse. Filed May 4, 1908. A single yielding device maintains the relative position of two conductors relatively close together.

946,576. RESISTANCE TERMINAL. Fletcher D. Hallock, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed January 3, 1906. A resistance unit comprises a casting having two branches of zigzag formation the outer extremities of which and the junction between which are enlarged and provided with holes to receive insulated rods, and having terminal or connecting members of relatively low resistance conducting material cast into the extremities of the branches, and provided with holes through which the molten metal may flow, and with projecting portions which are divided into two strips by a longitudinal slot or saw-cut.



946,576.—RESISTANCE TERMINAL.



946,643.—ELECTRIC STOVE.

946,590. ELECTRIC TROLLEY LINE CONSTRUCTION. Theodore Varney, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed June 4, 1906. Auxiliary diverging guard wires are located between trolley conductors which form a V-shaped junction.

946,597. SAFETY THERMAL CUT-OUT OR SWITCH. John W. Fowle, Wellesley, Mass. Filed December 5, 1907. Puncturable insulating material is included between a number of fingers connected to the several conductors of an electric circuit and a grounded contact plate.

946,623. INSULATOR FOR ELECTRIC LINES. Theodore Varney, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed June 8, 1907. An electric insulator comprises a body of insulating material and a metal cap cemented thereto and provided with a side groove and partially closed sleeve projections which form continuations of the groove and serve to clamp a wire or cable therein against lateral displacement.

946,624. OVERHEAD LINE STRUCTURE. Theodore Varney, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed June 8, 1907. Describes a method of suspension of a trolley conductor from a messenger wire or cable.

946,625. TROLLEY HANGER. Theodore Varney, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed July 8, 1909. A hanger for electric conductors comprises a conductor clamp, an overhead support and a triangular structure interposed between the two parts and having one side loosely secured to the other two.

946,643. ELECTRIC STOVE. Herman L. Millspaugh and Frank S. Vincent, Reed City, Mich., assignors of one-third to George D. Westover, Cadillac, Mich. Filed July 12, 1909. Posts supported in a nonconducting frame are electrically connected in sets, and connecting poles are arranged in the line of electric connection with the posts. The frame is made open to receive a reversible pan, and resistance coils are looped over the posts and connect them in pairs. Loops are provided for immediately attaching the coils to, or removing them from, the posts.

946,646. OUTLET OR JUNCTION BOX. Charles T. Pratt, Frankfort, N. Y. Filed April 19, 1907. Has features for quick installation or removal.

946,655. INSULATING TUBE. Michael L. Coffey, Providence, R. I., assignor to General Electric Company. Filed August 13, 1908. The tube has a body portion provided with side extensions for attaching to the side of a beam, etc., and end portions angularly disposed to the body portion.

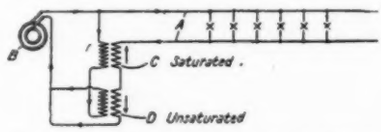
946,664. VIBRATOR FOR TELEPHONE TRANSMITTERS. Joseph P. Edwards, Chico, Cal. Filed July 15, 1909. The vibrator consists of a spring-impelled knocker for striking against the outside of the transmitter.

946,680. ELECTRIC SNAP-SWITCH. Norman Marshall, West Newton, Mass., assignor to the Arrow Electric Company, Hartford, Conn. Filed September 21, 1909. Conducting poles are connected to and movable with the lock plate.

946,685. MOVABLE CONTACT FOR ELECTRIC SWITCHES. Charles G. Perkins, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Filed January 14, 1909. A pair of contact plates formed of flexible conducting material are mounted on the supporting plate of the switch.

946,715. LIGHTING SYSTEM. William L. Bliss, Brooklyn, N. Y. Filed January 6, 1905. In an electric car-lighting system, an automatic switch disconnects a storage battery from a stationary source of electrical energy (independent of a generator, also provided), whenever the voltage of this source becomes less than that of the battery.

946,722. INSULATOR CLAMP. Walter G. Clark, New York, N. Y. Filed December 28, 1908. There is a clamp for the wire, besides an independent fastening means.



946,829.—COMPOUNDING ALTERNATING-CURRENT CIRCUITS.

946,725. MOUTHPIECE FOR TELEPHONES. Martin Elzas, Los Angeles, Cal. Filed April 15, 1909. An antiseptic may be secured between parts of the mouthpiece.

946,741. ELECTRIC FUSE HOLDER. John H. Trumbull, Plainville, Conn., assignor to the Trumbull Electric Manufacturing Company, Plainville, Conn. Filed June 6, 1905. Spring clips are secured to an insulating base.

946,751. ALTERNATING-CURRENT MOTOR CONTROL. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Company. Filed June 1, 1908. A control system is arranged to short-circuit the series-connected armatures of a pair of commutator-type motors for low-speed operation, and to open the short-circuit and impress a voltage on the armatures for high-speed operation.

946,753. ELECTRIC VEHICLE. Frank E. Case, Schenectady, N. Y. assignor to General Electric Company. Filed September 11, 1909. Describes the arrangements in an electrically driven car adapted for operation on currents differing in character.

946,779. INSULATING CHAIN FOR PULL-SWITCHES. Harvey Hubbell, Bridgeport, Conn. Filed May 17, 1909. Caps secured to each end of an insulating rod are each provided with an opening through which one of the link bars is passed.

946,813. DYNAMO-ELECTRIC MACHINE. Louis E. Underwood and Sven R. Bergman, Lynn, Mass., assignors to General Electric Company. Filed October 10, 1908. Describes an arrangement of fixed and removable teeth for a wound core.

946,829. COMPOUNDING ALTERNATING-CURRENT CIRCUITS. William Stanley, Great Barrington, Mass., assignor to General Electric Company. Filed May 13, 1909. In combination with a load circuit and a source of alternating current therefor are means for compounding the voltage supplied to the circuit under varying load, comprising two transformers having their primaries connected in series with each other and in shunt to the source and their secondaries connected in series with each other and with the load, the cores of the two transformers being so proportioned that one is saturated and the other unsaturated.

946,839. DISINFECTANT TELEPHONE MOUTHPIECE. Joseph W. Dixon, Dallas, Texas. Filed June 14, 1909. Disinfectant matter is placed with a casing having a perforated bottom within the mouthpiece and fitting the sides thereof.

946,878. SPARK PLUG. Joseph E. Schaefer, Jr., Cleveland, Ohio, assignor to Charles W. Fenner, Cleveland, Ohio, doing business

under the name Reflex Ignition Co., Cleveland, Ohio. Filed February 23, 1909. The wall around a central opening in the plug constitutes an electrode, and the central opening and openings adjacent thereto permit admission and exhaust of gas to and from the plug casing.

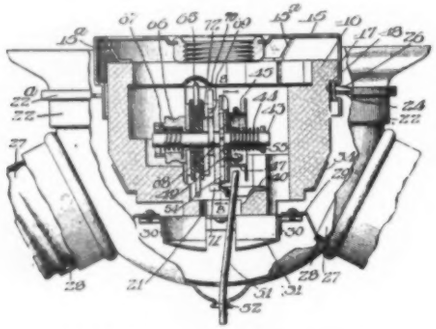
946,892. CLUSTER LAMP SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed November 29, 1907. An insulating member having a chamber therein carries lamp-engaging contacts; a rotary snap-switch mechanism is disposed in this chamber and has the axis of its rotary part extending across the chamber; and pull-actuated means extend to the exterior of the device for operating the switching mechanism.

946,903. ELECTROLYTE AND METHOD OF ELECTRODEPOSITING COPPER. Edward F. Kern, Knoxville, Tenn., assignor of one-half to Percy S. Brown, New York, N. Y. Filed September 1, 1909. A solution containing fluosilicate of copper and a soluble alkaline fluosilicate, is electrolyzed.

946,905. BATTERY HOLDER. Russell W. Magna, Holyoke, Mass. Filed February 11, 1909. Describes a support with circuit-forming connection for primary or other batteries.

946,922. ELECTRIC LIGHTING DEVICE. John Scharr, Nelson, Wis. Filed March 18, 1909. A depending lighting device has its terminals connected to trolley wheels running on a pair of metallic wires.

946,957. SIGNALING MEANS. Edward J. Burke, New York, N. Y., assignor of one-half to John Q. A. Whittemore, Newton, Mass.



946,892.—CLUSTER LAMP-SOCKET.

Filed March 26, 1908. A shaft operates circuit closers for a number of electric signaling devices.

946,982. LIGHTNING ARRESTER. Albert Oleson, Toledo, Ohio. Filed September 24, 1906. The core of a solenoid carries on one end an arc breaker, of nonconducting material.

946,983. CONTACT OR VIBRATOR SCREW. William L. Panikoff, New Haven, Conn. Filed May 13, 1909. A vibrator or contact screw comprises a screw shank formed with a longitudinally threaded passage, a screw threaded plug adapted to be entered into the passage, and a pin carried by the plug and adapted to be projected beyond the end of the screw.

946,990. GROUND-JOINT CONNECTION. Frederick E. Swope, Jr., Philadelphia, Pa. Filed March 17, 1909. Describes the means for locking the connection around a suitable conductor.

947,000. FIRE-ALARM SYSTEM. John P. Kelly, Basking Ridge, N. J. Filed March 3, 1909. In a fire-alarm system comprising signaling means at the signal and central stations, an electric-lighting means is turned on simultaneously with the operation of the signaling means at the sigal station.

947,053. SWITCH-OPERATING MECHANISM. Robert V. Cheatham, St. Matthews, Ky., assignor to Cheatham Electric Switching Device Company, Louisville, Ky. Filed May 6, 1909. The switch-operating mechanism and the switch-throwing device are connected by a shaft, but placed in individual compartments separated by a liquid-tight mercury seal.

947,059. ELECTRIC CONTROLLER. Arthur C. Eastwood, Cleveland, Ohio, and John S. McKee, Pittsburg, Pa. Filed March 2, 1909. Describes an automatic operating device for motor-driven screw-downs.

947,092. INDUCTION METER. Clifford D. Babcock, Jersey City, N. J., assignor to United Wireless Telegraph Company, New York, N. Y. Filed April 28, 1909. A meter for varying currents comprises a primary coil adapted to receive such currents, a closed secondary coil in inductive relation to the primary coil, a fluid in which the secondary coil is immersed, and means to measure the heating effects transmitted to the fluid.

947,094. INSULATOR. Edward Burton, Ansley, Neb. Filed February 4, 1909. A vertically split insulator block, in the halves of which are registering grooves to receive a conductor therethrough, is mounted on an inverted T-shaped bracket.

947,123. ELECTRIC LAMP SOCKET. Johann G. Peterson, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Filed October 25, 1909. A shell with teeth on its inner end is provided in combination with a cap containing a corrugated ring secured therein to engage the shell teeth, the shell and cap being latched together against endwise detachment.

947,148. TELEGRAPHONE. Ralph C. Browne, Salem, Mass., assignor to Browne Apparatus Company, Salem, Mass. Filed June 23, 1908. Renewed June 19, 1909. The mechanism for driving the reels for the record wire comprises a power-transmitting means and a momentum driver whose inertia is greater than that of the reels, the wire, and the power-transmitting means.

947,152. APPARATUS FOR AUTOMATIC EXTINGUISHING OF LAMPS AFTER A CERTAIN TIME. Erik A. Fagerlund, Stockholm, Sweden. Filed August 15, 1908. A cock is electrically operated.

947,154. ELECTRICAL RECEPTACLE MOUNTING. Edgar H. Freeman, Trenton, N. J., assignor to E. H. Freeman Electric Company, Trenton, N. J. Filed August 3, 1908. A supporting element has notches in the edge of the receiving hole, and the receptacle body has external ribs for engagement with the notches. A continuous spring band is sprung over this body between one side of the supporting element and adjacent end portions of the ribs.

947,155. SPARKING DEVICE. Isaac W. Giles, New Bedford, and Charles W. Tobey, Fairhaven, Mass. Filed March 3, 1909. Describes a complete induction and electromagnetic device and connections for a spark plug.

947,165. TROLLEY WHEEL. Bertrum F. Smith, Natrona, Pa., assignor of one-half to Jacob Markle, Natrona, Pa. Filed February 27, 1909. Describes a built-up trolley wheel.

947,185. INSULATING SUPPORT. George B. McBean, Chicago, Ill., assignor to Mechanical and Electrical Manufacturing Company, Chicago, Ill. Filed August 26, 1909. An insulating support for electrical connections, and means for securing it to a supporting wall, are described.

947,208. ALARM AND SIGNALING SYSTEM. George M. Willis, Chicago, Ill. Filed May 7, 1906. A spring-operated break-wheel has means associated with a separate winding mechanism for closing the circuit during the time of winding, and means for closing the circuit during part of the time of operation of the break-wheels.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired January 24, 1910:

490,279. ELECTRIC METER. Oscar Frolich, Berlin, Germany.

490,280. ELECTRIC MOTOR. Julius W. Hansen, St. Paul, Minn.

490,263. ELECTRIC SWITCH. Albert L. Roher, Lynn, Mass.

490,292. CUT-OUT FOR ELECTRIC CIRCUITS. Michael Leavy, Pittsfield, Mass.

490,297. ELECTRIC RAILWAY CONDUCTOR. Howard A. Miner, New York, N. Y.

490,306. CLOSED CONDUIT FOR ELECTRIC RAILWAYS. Russell Parker and Benjamin F. Sutton, Brooklyn, N. Y.

490,307. ELECTRIC LOCOMOTIVE. Alexander Philipsborn and Max Schiemann, Berlin, Germany.

490,327. ELECTRIC ANNUNCIATOR SYSTEM. Henry Van Hoevenbergh, New York, N. Y.

490,358. ELECTRICAL MUSICAL INSTRUMENT. Anacleto Montanelli, Portland, Ore.

490,363. ELECTRIC SWITCH. Albert L. Rohrer, Lynn, Mass.

490,376. ARMATURE FOR DYNAMO-ELECTRIC MACHINES OR MOTORS. Elihu Thomson, Swampscott, Mass.

490,449. DYNAMO-ELECTRIC MACHINE. Robert Lundell, Brooklyn, N. Y.

490,460. DYNAMO-ELECTRIC MACHINE. Chas. Wachtel, Newark, N. J.

490,477. ELECTRICAL CONNECTING DEVICE. Joseph Hutchinson, New York, N. Y.

490,479. ELECTRIC SHOW-CASE ALARM. Rudolph C. Kruschke, Duluth, Minn.

490,534. SUPPORT FOR TELEGRAPH CABLES. Frederick Le B. Nedwell, London, England.

490,597. CONDUCTOR SYSTEM FOR ELECTRIC RAILWAYS. Ralph Hayden, Fairmont, W. Va.

490,605. ELECTRIC LAMP SOCKET AND TAP. Alexander F. Vetter, New York, N. Y.

490,616. SAFETY LOCK FOR RAILROAD SWITCHES. Johan E. Sandelin, New York, N. Y.

490,626. RAILWAY SIGNAL. Ira L. Green, Kittanning, Pa.

490,630. ELECTRIC CONDUIT. Ernest L. Ransome, Oakland, Cal.